FINAL

Recommendation for No Further Investigation at Study Area 6 (SA 6)

McClellan Air Force Base
California

Prepared For

Air Force Center for Environmental Excellence
Brooks Air Force Base,
Texas

and

Environmental Management
McClellan Air Force Base
California

April 1999

PARSONS
PARSONS ENGINEERING SCIENCE, INC.
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From: Hansen, Jerry E, Mr, HQAFCEE [Jerry.Hansen@HQAFCEE.brooks.af.mil]
Sent: Tuesday, August 08, 2000 10:16 AM
To: 'nwalton@dtic.mil'
Subject: Distribution statement for AFCEE/ERT reports

Norman, This is a followup to our phone call. The eight boxes of reports you received from us are all for unlimited distribution. If you have any questions, you can contact me at DSN 240-4353.

FINAL

RECOMMENDATION FOR NO FURTHER INVESTIGATION AT STUDY AREA 6 (SA 6)

McCLELLAN AIR FORCE BASE, CALIFORNIA

Prepared for:

Air Force Center for Environmental Excellence
Brooks AFB, Texas

and

Environmental Management
McClellan Air Force Base, California

Contract F41624-92-8036, Delivery Order 17

April 1999

Prepared by:

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ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
µg/L	Microgram per liter
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
ASTM	American Society for Testing and Materials
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, xylenes
BW	Base well
CAC	California Administrative Code
COPCs	Contaminants of potential concern
DI-WET	Deionized water waste extraction test
DL	Designated level
DLM	Designated Level Methodology
DOT	Department of Transportation
DWR	Department of Water Resources
EAF	Environmental attenuation factor
EMR	Environmental Management Office
ES	Engineering-Science, Inc.
EW	Extraction well
IC 7	Investigation Cluster 7
ID	Inside diameter
IRP	Installation Restoration Program
LUFT	Leaking underground fuel tank
mg/kg	Milligrams per kilogram
NFI	No further investigation
OD	Outside diameter
OU	Operable unit
Parsons ES	Parsons Engineering Science, Inc.
PID	Photoionization detector
ppmv	Parts per million, volume per volume
PQL	Practical quantitation limit
PRL	Potential release location
PZ	Piezometer
QA	Quality assurance
QAPP	Quality assurance project plan
QC	Quality control
RI	Remedial investigation
RICS	Remedial Investigation Characterization Summary
RI/FS	Remedial investigation/feasibility study
RL	Reporting limit

RWQCB	Regional Water Quality Control Board
SA 6	Study Area 6
SAI	Specialized Assays, Inc.
SAP	Sampling and analysis plan
SESOIL	Seasonal Soil Compartment Model
SM-ALC	Sacramento Air Logistics Center
SOP	Standard operating procedure
SVE	Soil vapor extraction
SWRCB	State Water Resources Control Board
TPH	Total petroleum hydrocarbons
TPH-d	Total petroleum hydrocarbons as diesel
TPH-g	Total petroleum hydrocarbons as gasoline
TVH	Total volatile hydrocarbons
TVHA	Total volatile hydrocarbon analyzer
USEPA	US Environmental Protection Agency
UST	Underground storage tank
VMP	Vapor monitoring point
VOC	Volatile organic compound
VW	Vent well
WQG	Water quality goal

SECTION 1

INTRODUCTION

1.1 PURPOSE

This recommendation for no further investigation (NFI) report for Study Area 6 (SA 6) at McClellan Air Force Base (AFB), California has been prepared by Parsons Engineering Science, Inc. (Parsons ES; formerly Engineering-Science, Inc. [ES]) for submittal to the California Regional Water Quality Control Board (RWQCB), Central Valley Region; the US Air Force Center for Environmental Excellence (AFCEE), Brooks AFB, Texas; and the Sacramento Air Logistics Center Environmental Management Office (SM-ALC/EMR), McClellan AFB, California. This report has been prepared as part of the AFCEE Extended Bioventing Project (Contract F41624-92-8036, Delivery Order 17). The purpose of this report is to document the effectiveness of soil remediation at SA 6 and to provide data to support an NFI decision for the site.

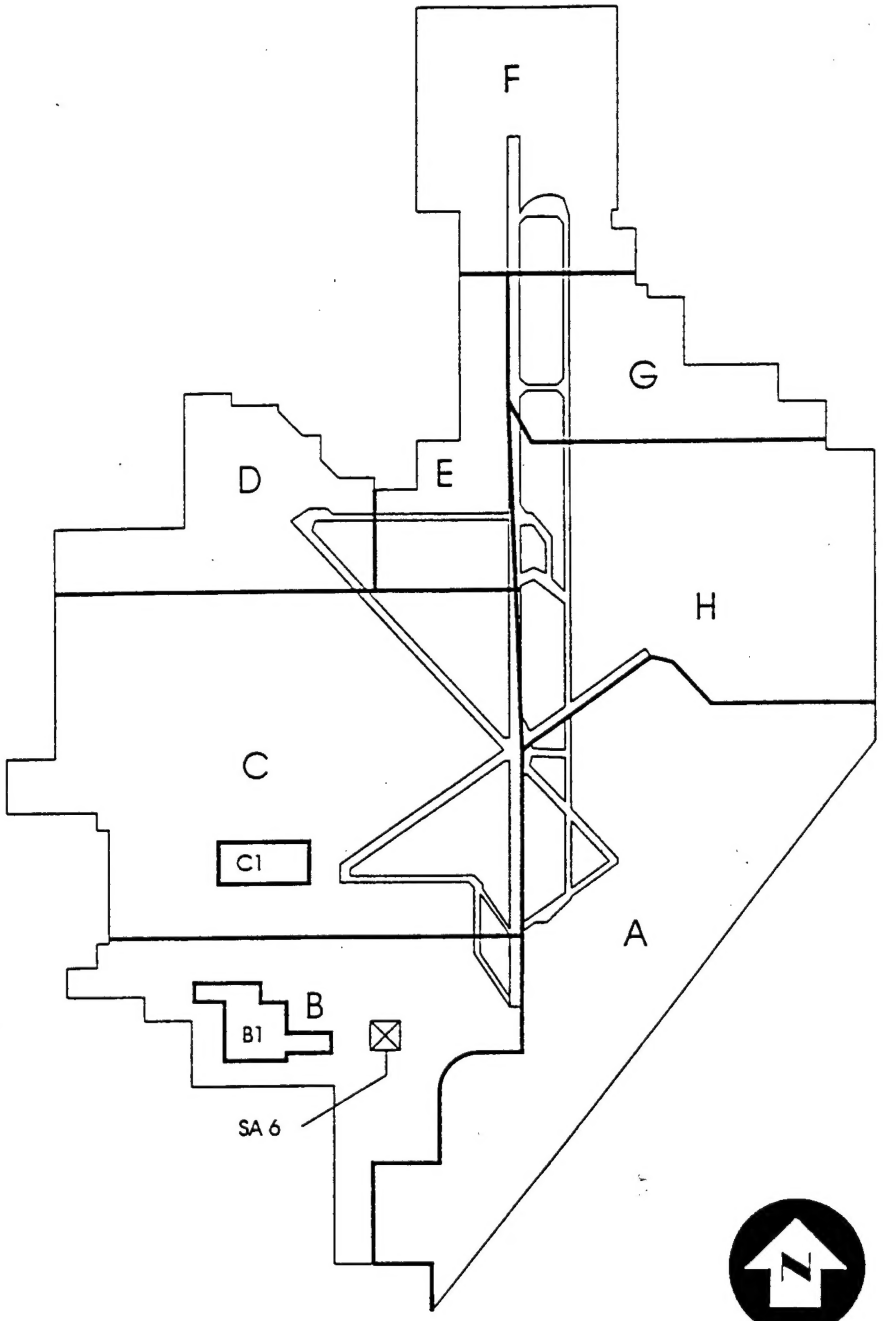
1.2 SITE AND PROJECT BACKGROUND

1.2.1 Site Description and Background

SA 6 is located in the southwestern portion of the base within Operable Unit B (OU B) (Figure 1.1), south of Building 656, and west of Building 655 (Figure 1.2). The site is the former location of a gasoline service station (Building 657) and its associated underground storage tanks (USTs) which were located immediately east of the former building. The site is currently near the center of a large, paved parking lot.

The former service station operated from 1955 until 1990. The two gasoline USTs and two diesel USTs which supplied the station were removed in 1990 and 1991. Initial investigations conducted by the Base determined that the USTs had leaked and contaminated the soil.

Subsequent investigations conducted at SA 6 identified fuel hydrocarbons, volatile organic compounds (VOCs) including benzene, toluene, ethylbenzene, and xylenes (BTEX), and halogenated VOCs in soil, soil vapor, and groundwater (ES, 1994; Radian, 1995). Although halogenated VOCs (chlorinated compounds) have been detected at SA 6, the Remedial Investigation Characterization Summary (RICS) (Radian, 1995) concluded that the source of these compounds is Investigation Cluster 7 (IC 7), another OU B site northwest of SA 6. Because only petroleum hydrocarbon contamination is attributed to the former gasoline service station, the RICS concluded



EXPLANATION

BOUNDARIES OF OPERABLE UNITS

McCLELLAN AFB BOUNDARY

FIGURE 1.1

SITE LOCATION

SA 6
McClellan AFB, California

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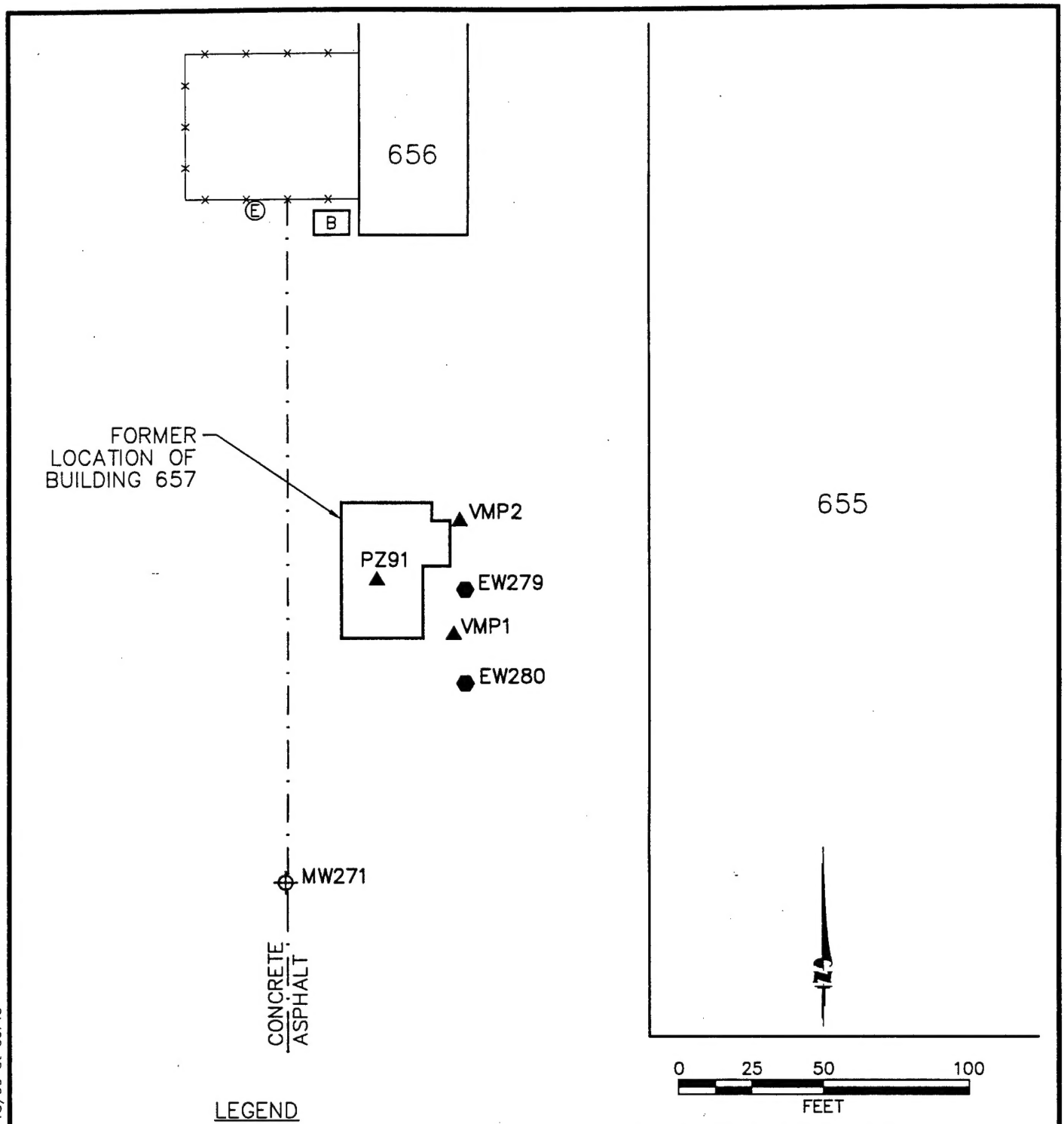

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FIGURE 1.2

SITE LAYOUT

SA 6
McClellan AFB, California

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

that only total petroleum hydrocarbons (TPH) and BTEX were contaminants of potential concern (COPCs) at SA 6.

Within OU B, groundwater is typically encountered between 100 and 120 feet below ground surface (bgs) (Radian, 1996). Groundwater beneath SA 6 is encompassed in a capture zone created by groundwater extraction at Base Well 18 (BW-18) and Extraction Well (EW-304), located approximately 600 feet southwest and 300 feet northwest of SA 6, respectively.

1.2.2 Project Background

Since 1992, McClellan AFB has participated in two AFCEE-sponsored bioventing projects: currently the Extended Bioventing Project, and formerly the Bioventing Pilot Test Initiative. As part of the nationwide Bioventing Pilot Test Initiative, *in situ* bioventing pilot tests were conducted at approximately 145 sites at 56 Air Force installations, including SA 6 and five other McClellan AFB sites (ES, 1994; Parsons ES, 1996) (Bioventing pilot testing at a seventh McClellan AFB site, Site ST200, has been performed under the Extended Bioventing Project [Parsons ES, 1998c]). These tests were designed to collect data on the effectiveness of bioventing for the remediation of soil contaminated with fuel hydrocarbons (e.g., JP-4 jet fuel, diesel fuel, gasoline, or heating oil). Based on the success of the Bioventing Pilot Test Initiative, the Extended Bioventing Project provided funding for pilot testing, system expansion, continued system operation, and for confirmation or closure soil sampling when system monitoring results indicated sufficient remediation of petroleum-contaminated soils. Four McClellan AFB sites (Potential Release Location [PRL] T-18, SA 6, ST200, and the Davis Global Communications Site in Davis, California) were included in the Extended Bioventing Project. One site, PRL T-18 (also known as Tank Farm #4) has already received NFI status (Parsons ES, 1997; California RWQCB, 1997).

1.2.2.1 Bioventing Pilot Test Activities

Beginning in July 1993, activities performed at SA 6 as part of the Bioventing Pilot Test Initiative included the following (ES, 1994; AFCEE, 1995):

- Use of two existing extraction wells (EW279 and EW280) as air injection vent wells (VWs) (in previous reports these wells have been referred to as VW-18 and VW-19);
- Installation of two new vapor monitoring points (VMP1 and VMP2) to supplement the existing VMP (Piezometer 91 [PZ91], also referred to as VPN-20 in previous reports);
- Baseline soil and soil vapor sampling and *in situ* respiration testing;
- Bioventing blower system installation;

- Air permeability and oxygen influence testing; and
- Extended pilot-scale bioventing system operation followed by 1-year soil and soil vapor sampling and *in situ* respiration testing.

1.2.2.2 Extended Bioventing Activities

Based on encouraging 1-year results that indicated petroleum contaminant concentrations and biodegradation rates in site soils had been reduced by 1 order of magnitude and were within the influence of the pilot-scale bioventing system (AFCEE, 1995), continued system operation was recommended and SA 6 was included in the AFCEE Extended Bioventing Project for site closure (Option 2). To guide closure/confirmation sampling activities, a sampling and analysis plan (SAP) was prepared by Parsons ES (1998a) for AFCEE, McClellan AFB, and California RWQCB review and approval. A copy of the approved SAP is provided as Appendix A of this report. Sampling activities performed at SA 6 in accordance with the SAP have included the following:

- Confirmation soil vapor sampling in March 1998 and May 1998 to verify site readiness for closure following approximately 4.5 years of bioventing treatment of site soils; and
- Soil sampling and collection of one groundwater sample in October 1998 to support an NFI recommendation for the site.

Results of the soil vapor sampling event were provided in a Parsons ES (1998b) letter to AFCEE, McClellan AFB, and California RWQCB and are summarized in this report along with results from the soil and groundwater sampling event.

1.3 SUMMARY OF CONFIRMATION SAMPLING RESULTS

Minimal petroleum hydrocarbon contamination was evident in site soils and groundwater based on sample results obtained from the October 1998 confirmation sampling event. Total petroleum hydrocarbons as diesel (TPH-d) were detected above laboratory reporting limits (RLs) in 3 of 15 soil samples, and TPH as gasoline (TPH-g) also were detected in 3 of 15 soil samples. Maximum detected concentrations of TPH-d and TPH-g were 409 milligrams per kilogram (mg/kg) and 8.55 mg/kg, respectively. The TPH remaining in site soils appears to be relatively insoluble; a maximum soluble TPH-d concentration of 1,060 micrograms per liter (μg/L) was detected in soils at 32.5 feet bgs. Confirmation soil sample results indicate that the BTEX constituents have been nearly completely biodegraded as a result of air injection bioventing at SA 6. Other than total xylenes detected in one sample at 0.831 mg/kg, no BTEX was detected in site soils following more than 4.5 years of pilot-scale bioventing system operation. In addition, no BTEX was detected in a Hydropunch® groundwater sample collected beneath source area soils. Soil vapor results from previous sampling events in 1998 suggest site soils are well oxygenated, without active air injection, and will not benefit significantly from further bioventing treatment. Based on these results, and comparison to California RWQCB (1989; 1998) and California State Water Resource Control Board

(California SWRCB, 1989) guidelines, SA 6 soils no longer appear to pose a threat to groundwater and an NFI decision is recommended. Results of a modeling analysis performed at the request of California RWQCB (1999) for SA 6 confirm these findings and support the NFI recommendation.

1.4 REPORT ORGANIZATION

This NFI recommendation report consists of five sections, including this introduction, and five appendices. Section 2 summarizes soil vapor results, as well as follow-on soil and groundwater sampling activities. Section 3 summarizes the soil and groundwater analytical results. Section 4 presents conclusions and recommendations, and Section 5 lists the references that were used in preparation of this report. Appendix A presents a copy of the SAP for SA 6, which includes a detailed site description and summary of previous site investigations. Appendix B provides copies of soil boring logs from the soil sampling event. Appendix C presents laboratory analytical data for site environmental and quality assurance/quality control (QA/QC) samples. Appendix D presents the Parsons ES data quality assessment report. Appendix E provides the input and output files for the modeling analysis.

SECTION 2

SOIL VAPOR RESULTS AND FOLLOW-ON SAMPLING ACTIVITIES

The purpose of this section is to summarize soil vapor sampling results from the March 1998 and May 1998 sampling events, as well as soil and groundwater sampling activities performed in October 1998. Field-screening and laboratory analytical soil vapor results are presented in Section 2.1. Soil and groundwater sampling activities, including sampling depths, sampling procedures, and analytical methods used are presented in Section 2.2. Figure 2.1 shows the locations where soil vapor, soil, and groundwater sampling were performed, in addition to the pre-bioventing estimated area of petroleum hydrocarbon contamination in soil and soil vapor. Sampling methods/procedures are described in more detail in the SAP for SA 6 (Appendix A).

The SAP was implemented by qualified Parsons ES scientists trained in conducting soil vapor, soil, and groundwater sampling, records documentation, and chain-of-custody procedures. Confirmation sampling activities were performed in accordance with the McClellan AFB Basewide Remedial Investigation/Feasibility Study (RI/FS) Quality Assurance Project Plan (QAPP) (Radian, 1997) and Standard Operating Procedures (SOPs).

2.1 SOIL VAPOR RESULTS

Soil vapor sampling was performed on 11 March 1998 following more than 1 month of bioventing system shutdown at SA 6. A second soil vapor sampling event also was performed on 22 May 1998 because vacuum measurements at the VMP screened intervals during the March 1998 sampling indicated that site soils were not under equilibrium conditions and were being influenced by the nearby soil vapor extraction (SVE) system at IC 7. Consequently, both the bioventing system at SA 6 and the SVE system at IC 7 were shut down approximately 1 month prior to the May 1998 sampling event to allow development of equilibrium (i.e., static) conditions in subsurface site soils.

During the March and May 1998 sampling events, soil vapor samples were collected from the vent wells (EW279 and EW280) and the VMPs (VMP1, VMP2, and PZ91) in accordance with procedures described in the SAP (Appendix A). Samples were field-screened to assess soil vapor concentrations of oxygen, carbon dioxide, total volatile hydrocarbons (TVH), and ionizable compounds. Samples from the VMPs also were submitted for laboratory analysis of TPH-g and BTEX by US Environmental Protection Agency (USEPA) Method TO-3. Soil vapor samples were analyzed by Air Toxics Ltd.

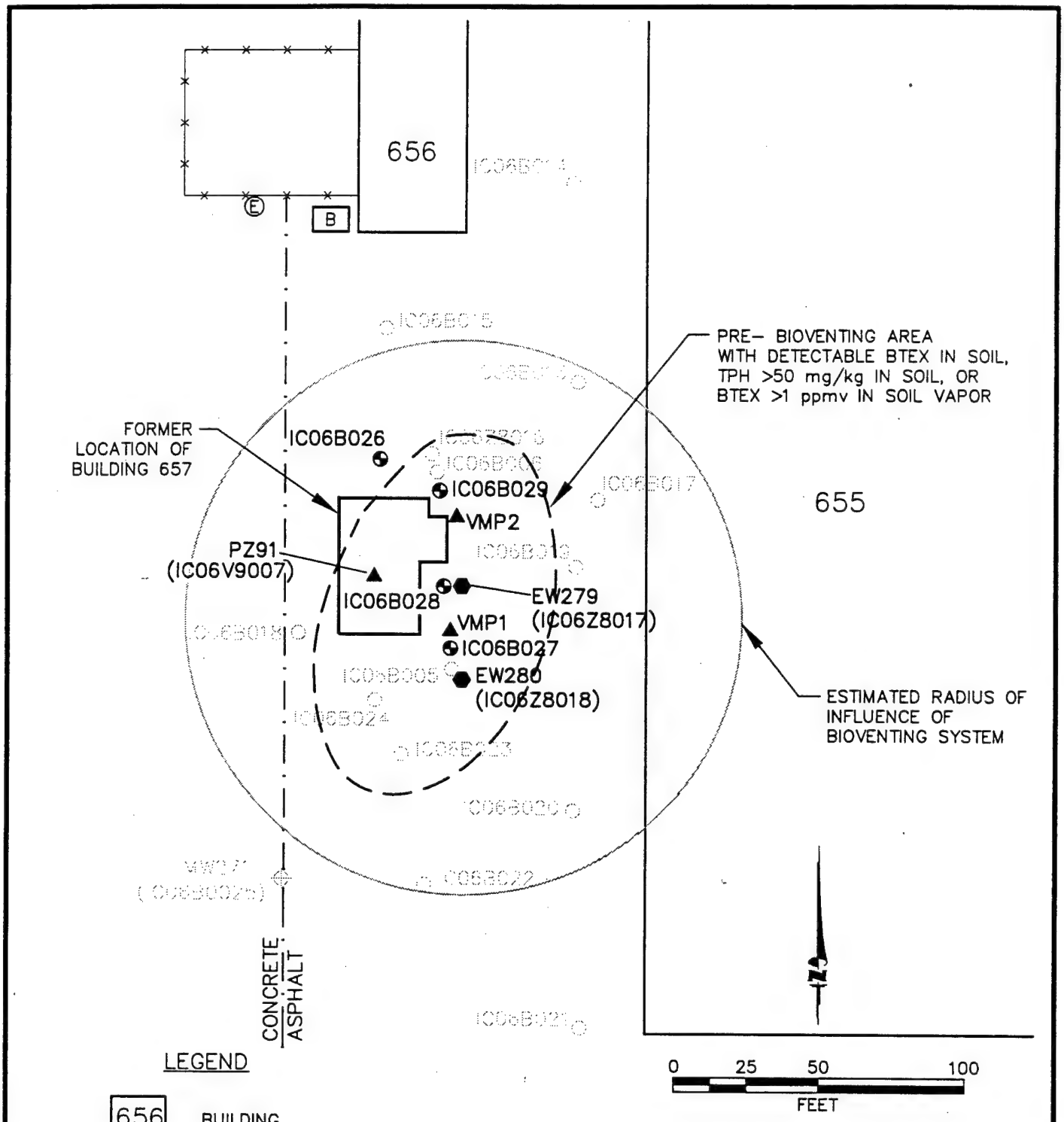

FIGURE 2.1

CONFIRMATION SAMPLING LOCATIONS

SA 6
McClellan AFB, California

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

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in Folsom, California. Table 2.1 summarizes field soil vapor results and laboratory-determined concentrations of petroleum hydrocarbons in site soil vapor from the 1998 sampling events and previous sampling events.

2.1.1 Field-Screening Data Summary

Field measurements of static soil vapor concentrations as determined during the May 1998 sampling event indicated the following:

- Static oxygen concentrations in site soil vapor were at, or near, atmospheric levels (20.9 percent), with the exception of the 19.5-foot depth interval of VMP2 (VMP2-19.5) (3.9 percent), VMP2-30 (6.4 percent), and PZ91-24 (13.9 percent);
- TVH, carbon dioxide, and photoionization detector (PID) measurements indicated little remaining VOC and TPH contamination at EW279, EW280, and most VMP screens greater than 40 feet bgs;
- The highest concentrations of TVH (250 parts per million, volume per volume [ppmv]) and ionizable compounds (47.5 ppmv) and lowest static oxygen concentration (3.9 percent) were measured VMP2-19.5; and
- Site soils had been effectively remediated during more than 4.5 years of bioventing system operation at SA 6.

2.1.2 Laboratory Analytical Data Summary

Analytical soil vapor results from the May 1998 sampling event indicated the following:

- The remaining petroleum hydrocarbon contamination in site soils appeared most significant in the vicinity of VMP1-17 where TPH-g concentrations of 37,000 ppmv and total BTEX concentrations of 469 ppmv were detected;
- Petroleum hydrocarbon concentrations at VMP2-19.5 were slightly elevated with average (of primary and replicate samples) TPH-g and total BTEX results of 135 ppmv and 1.92 ppmv, respectively; and
- Petroleum hydrocarbon concentrations quickly dissipate with increasing depth as TPH-g and BTEX concentrations at VMP1-30 and VMP2-30 were approximately 3 orders of magnitude less than those measured at VMP1-17, and near non-detect concentrations were measured at VMP1-54 and VMP2-49.

2.1.3 Sampling and Analysis Plan Modifications Based on Soil Vapor Results

Based on the May 1998 soil vapor results, the added benefit of continued air injection bioventing appeared to be minimal and confirmation soil sampling in support

TABLE 2.1
SUMMARY OF FIELD AND LABORATORY ANALYTICAL SOIL VAPOR RESULTS
SA 6
McCLELLAN AFB, CALIFORNIA

			Field-Screening Data				Laboratory Analytical Data[f/]				
Sample Location	Depth (feet bgs)[a/]	Sampling Event (Date)	Oxygen (percent)	Carbon Dioxide (percent)	TVH[b/] (ppmv)[c/]	PID[d/] (ppmv)	TPH-g[e/] (ppmv)	Benzene (ppmv)	Toluene (ppmv)	Ethylbenzene (ppmv)	Xylenes (ppmv)
EW 279	25-100	Initial (8/93)	1.0	12.0	> 10,000[g/]	2,600	14,000	130	140	9.4	130
		1-Year (9/94)	21.0	0.0	34	41.3	220	0.21	1.6	1.0	11
		4.5-Year (3/98)[h/]	n.a.[i/]	n.a.	n.a.	n.a.	---[j/]	---	---	---	---
		4.5-Year (5/98)	20.1	0.6	0	2.2	---	---	---	---	---
EW 280	15-100	Initial (7/93)	16.5	2.5	58	91	55	< 0.004[k/]	0.13	0.051	0.35
		1-Year (9/94)	21.0	0.0	0	5.9	6.0	< 0.002	0.033	0.022	0.096
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	---	---	---	---	---
		4.5-Year (5/98)	19.6	1.0	80	12.0	---	---	---	---	---
VMP1	17	Initial (8/93)	1.2	15.2	> 10,000	292	130,000	490	320	34	170
		1-Year (9/94)	4.0	2.2	2,600	2,341	3,300	15	27	18	130
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	---	---	---	---	---
		4.5-Year (5/98)	NR[l/]	NR	NR	NR	37,000	77	130	52	210
	30	Initial (8/93)	1.0	12.2	5,200	1,727	---	---	---	---	---
		1-Year (9/94)	16.9	0.5	0	10.9	---	---	---	---	---
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	1.6	0.034	0.16	0.056	0.23
		4.5-Year (5/98)	18.5	0.8	140	36.9	54	0.052	0.38	0.27	1.4
	54	Initial (8/93)	10.5	5.5	1,000	387	---	---	---	---	---
		1-Year (9/94)	21.0	0.0	0	8.0	---	---	---	---	---
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	1.3	< 0.022	0.090	< 0.022	0.10
		4.5-Year (5/98)	20.5	0.8	95	11.3	5.5 / 5.7[m/]	0.031 / 0.031	0.072 / 0.077	0.032 / 0.032	0.18 / 0.18
VMP2	19.5	Initial (8/93)	1.2	20.0	> 10,000	682	---	---	---	---	---
		1-Year (9/94)	0.0	16.0	> 10,000	434	---	---	---	---	---
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	2.4	0.058	0.15	0.043	0.25
		4.5-Year (5/98)	3.9	5.0	250	47.5	120 / 150	0.15 / 0.27	0.23 / 0.44	0.34 / 0.28	0.93 / 1.2
	30	Initial (8/93)	2.2	12.0	> 10,000	968	---	---	---	---	---
		1-Year (9/94)	3.5	2.2	5,800	3,477	---	---	---	---	---
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	4.0	0.076	0.30	0.050	0.32
		4.5-Year (5/98)	6.4	4.4	160	20.0	34	0.27	1.0	0.21	1.0
	49	Initial (8/93)	3.0	9.2	5,400	1,448	---	---	---	---	---
		1-Year (9/94)	21.0	0.0	1,000	540	---	---	---	---	---
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	1.5	0.025	0.13	0.038	0.19
		4.5-Year (5/98)	20.0	0.7	60	0.2	8.8	0.021	0.057	< 0.013	0.076
PZ91	24	Initial (7/93)	1.5	10.0	> 10,000	n.a.	13,000	38	35	6.6	22
		1-Year (9/94)	13.2	2.9	300	248	68	0.11	0.33	0.20	2.0
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	1.4 / 1.0	0.026 / 0.016J[n/]	0.13 / 0.082	0.038 / 0.027	0.19 / 0.14
		4.5-Year (5/98)	13.9	0.9	65	0.0	2.9	< 0.027	0.027	< 0.027	0.060

TABLE 2.1 (Continued)
SUMMARY OF FIELD AND LABORATORY ANALYTICAL SOIL VAPOR RESULTS
SA 6
McCLELLAN AFB, CALIFORNIA

Sample Location	Depth (feet bgs)[a/]	Sampling Event (Date)	Field-Screening Data				Laboratory Analytical Data[f/]				
			Oxygen (percent)	Carbon Dioxide (percent)	TVH[b/] (ppmv)[c/]	PID[d/] (ppmv)	TPH-g[e/] (ppmv)	Benzene (ppmv)	Toluene (ppmv)	Ethylbenzene (ppmv)	Xylenes (ppmv)
PZ91	37	Initial (8/93)	1.0	9.5	>10,000	n.a.	---	---	---	---	---
		1-Year (9/94)	16.5	0.5	76	75.7	---	---	---	---	---
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	1.7	0.043	0.16	0.042	0.20
		4.5-Year (5/98)	18.5	1.1	70	0.0	3.5	<0.026	0.035	<0.026	0.097
	49	Initial (8/93)	3.0	7.2	3,400	n.a.	---	---	---	---	---
		1-Year (9/94)	19.9	0.0	58	62.5	---	---	---	---	---
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	1.2	<0.025	0.10	0.028	0.13
		4.5-Year (5/98)	20.0	0.8	75	0.0	2.8	<0.026	0.030	<0.026	0.059
	57	Initial (8/93)	1.5	7.0	900	n.a.	---	---	---	---	---
		1-Year (9/94)	20.5	0.0	35	799	---	---	---	---	---
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	3.2	0.060	0.30	0.088	0.39
		4.5-Year (5/98)	20.1	0.7	70	0.0	0.83	<0.026	<0.026	<0.026	0.027
	75	Initial (8/93)	3.0	7.8	73	n.a.	---	---	---	---	---
		1-Year (9/94)	20.5	0.0	40	46.0	---	---	---	---	---
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	3.3	0.052	0.25	0.084	0.37
		4.5-Year (5/98)	20.7	0.6	60	0.0	0.99	<0.025	0.039	<0.025	0.041
	99	Initial (8/93)	3.2	4.8	75	n.a.	---	---	---	---	---
		1-Year (9/94)	20.5	0.0	26	34.4	---	---	---	---	---
		4.5-Year (3/98)[h/]	n.a.	n.a.	n.a.	n.a.	3.4	0.038	0.19	0.052	0.24
		4.5-Year (5/98)	20.0	0.9	90	2.9	2.2	<0.026	<0.026	<0.026	0.055

[a/] ft bgs = feet below ground surface.
[b/] TVH = Total volatile hydrocarbons.
[c/] ppmv = Parts per million, volume per volume.
[d/] PID = Photoionization detector results quantifying ionizable compounds.
[e/] TPH-g = Total petroleum hydrocarbons (hydrocarbons with 2 or more carbon rings) referenced to gasoline.
[f/] Laboratory analysis of soil gas by USEPA Method TO-3.
[g/] > = Concentration greater than maximum reading on field instrument.
[h/] SVE system at adjacent site was operating during the March 1998 sampling event influencing soil vapor results.
[i/] n.a. = Not available.
[j/] --- = Not analyzed.
[k/] < = Compound analyzed for, but not detected. Number shown represents the laboratory reporting limit.
[l/] NR = No readings; monitoring point screened interval produced water during field measurements.
[m/] Original sample result/duplicate result.
[n/] J = Analyte detected, but below the laboratory reporting limit. Number shown is a laboratory estimate.

of a NFI recommendation for SA 6 (as proposed in the SAP) was recommended with the following modifications (Parsons ES, 1998b).

- The first soil sample from each of four borings would be collected between 15 and 20 feet bgs based on the soil vapor concentrations detected at VMP1-17 (the SAP proposed collecting the first soil sample at least 20 feet bgs).

- After delineating the vertical extent of contamination near former soil boring IC06B006, proposed soil boring IC06B029 could be drilled to groundwater without further soil sampling in order to collect a Hydropunch® groundwater sample (The SAP proposed soil sampling IC06B029 at 10-foot intervals until reaching groundwater. However, as further discussed in Section 2.2.2 of this report, continuous coring of boring IC06B029 actually was performed).

2.2 SOIL SAMPLING PROCEDURES

2.2.1 Soil Boring Locations and Sampling Depths

Confirmation soil sampling was conducted at the site between 14 and 16 October 1998. Four soil borings were advanced and sampled in the vicinity of the former USTs (Figure 2.1). Three of the four borings (IC06SB027, IC06SB028, and IC06SB029) were located in areas where the maximum concentrations of TPH and BTEX were detected in soil and soil vapor samples during prior investigations (i.e., adjacent to IC06B006, IC06B005/VMP1, and EW279) (Tables 2.1 and 2.2 of Appendix A). The fourth boring (IC06B026) was located north of PZ91 where the northern extent of the former UST excavation was terminated due to a utility line.

Soil borings were advanced using a drill rig equipped with 8-inch outside-diameter (OD) hollow-stem augers. Continuous coring of the borings was conducted starting at 15 feet bgs in order to determine the most contaminated soil intervals for sampling. Samples for geologic logging, field screening, and possible chemical analysis were collected from 15 feet bgs to the total depth of each boring. Other than boring IC06B029 which was advanced to groundwater at 116 feet bgs for the purpose of collecting a Hydropunch® groundwater sample, the total depth of the soil borings was determined based on multiple field observations which indicated that the vertical extent of contamination was adequately delineated. Soil borings IC06B026, IC06B027, and IC06B028 were advanced to total depths of 40.5, 55, and 58.5 feet bgs, respectively. To provide complete documentation of the sampling event, detailed boring logs were generated by the Parsons ES field geologist. Boring logs from the confirmation soil sampling event are provided in Appendix B of this report.

2.2.2 Soil Sampling

Undisturbed soil samples, suitable for chemical analysis, were collected from soil borings using a standard split-barrel sampler fitted with three pre-cleaned, 6-inch long, thin-walled, brass sleeves. For each sampling interval, the sampler was lowered through the hollow stem of the augers and driven approximately 1.5 feet into

undisturbed soil, ahead of the augers. After sample collection, the soil sampler was retrieved, split apart, and the brass sleeves were removed. A portion of soil from each split spoon was examined for physical evidence of hydrocarbon contamination (e.g., odors and staining) and evaluated by soil headspace measurements using a total volatile hydrocarbon analyzer (TVHA) and a photoionization detector (PID). Soil types were described in accordance with the standard Parsons ES soil description format. At each sampling interval, the brass sleeves that were not used for field evaluation were immediately capped with Teflon® tape and plastic endcaps in preparation for possible laboratory submittal.

A total of 15 soil samples, including a minimum of 3 samples per soil boring, were submitted for laboratory analysis. Soil samples for laboratory analysis were selected from the most contaminated sample intervals based on field observations and measurements. As indicated by the soil vapor sampling results (Section 2.1), the most contaminated soil intervals generally occurred in soils less than 40 feet bgs. Field screening suggested that the most contaminated soil was present in soil boring IC06SB028 between 15 and 18 feet bgs (Appendix B). At soil boring IC06SB029, TVHA headspace measurements greater than 100 ppmv were observed down to approximately 88 feet bgs. As a result of these measurements, continuous soil coring to groundwater was performed at IC06SB029. Soil samples selected for laboratory analysis were labeled with the site name and borehole number, sample depth, date of collection, and other pertinent data. Sample containers were placed in an insulated shipping container packed with ice. Samples for laboratory analysis were shipped under standard chain-of-custody procedures to Specialized Assays, Inc. (SAI) in Nashville, Tennessee.

2.2.3 Equipment Decontamination

All sampling and downhole equipment were decontaminated in accordance with McClellan AFB SOPs for drilling and soil sampling operations, except that isopropanol was used in place of methanol as a final decontamination step for the soil samplers and sampling tools. All decontamination fluids and drill cuttings were containerized on site in labeled US Department of Transportation (DOT)-approved 55-gallon drums provided by the base contractor. Containerized wastes were transported to the appropriate disposal facility by the base contractor. Soil borings were abandoned with a bentonite/cement grout mixture. At the surface, soil boring abandonment involved concrete and asphalt patch completion to match the existing pavement.

2.2.4 Soil Analyses

All samples were analyzed by SAI, a State of California-certified laboratory. Soil samples were analyzed by USEPA Method SW8015-modified for TPH-d and TPH-g, by USEPA Method SW8021B for BTEX, and by American Society for Testing and Materials (ASTM) D-2216 for soil moisture. Soil samples determined by the laboratory to contain total TPH also were analyzed for soluble TPH using the waste extraction test preparation method described in California Administrative Code (CAC)

Title 22, Article 11, Section 66700 (C through F) except that the extraction solution for the test was deionized water (DI-WET).

2.3 GROUNDWATER SAMPLING

During the confirmation sampling event, one groundwater sample was collected from soil boring IC06B029 upon reaching the water table at approximately 116 feet bgs. Groundwater sampling was performed in accordance with the McClellan AFB RI/FS SOP for Hydropunch® sampling. The groundwater sample was submitted to SAI for BTEX analysis by Method SW8021B.

2.4 FIELD AND LABORATORY DATA QUALITY ASSURANCE/QUALITY CONTROL

Samples were collected, preserved, transported, and analyzed in such a manner that the sampling results would provide a reliable representation of the soil and groundwater quality at the site. To meet this requirement, the procedures described in Section 3 of the SAP (Appendix A) were followed during sample collection, handling, and analysis.

Parsons ES performed a Level III validation of the SA 6 soil and groundwater data. Results of the assessment indicated that no data should be rejected based on validation, and all data are usable for the purposes intended. A copy of the data quality assessment report has been provided as Appendix D.

SECTION 3

CONFIRMATION SOIL AND GROUNDWATER SAMPLING RESULTS

This section summarizes the analytical results from the confirmation soil and groundwater sampling activities. Because no specific site cleanup standards apply to petroleum-contaminated soils at McClellan AFB, the potential threat of remaining residual soil contamination to site groundwater was assessed based on California SWRCB and RWQCB guidelines. Specifically, the adequacy of soil remediation at SA 6 was evaluated against guidelines and assessment methodologies presented in the *Leaking Underground Fuel Tank (LUFT) Field Manual: Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure* (California SWRCB, 1989) and the *Designated Level Methodology (DLM) for Waste Classification and Cleanup Level Determination* (California RWQCB, 1989). Confirmation sample results and site-specific factors supporting a recommendation for NFI also are discussed in this section.

Borehole logs from the confirmation sampling event are included in Appendix B, and complete soil and groundwater analytical results are presented in Appendix C.

3.1 SOIL ANALYTICAL RESULTS

Confirmation soil sampling analytical results are presented in Table 3.1. Total TPH-d were detected above laboratory RLs in three samples (IC06SB028 at 16 feet bgs, and IC06SB029 at 19 and 32.5 feet bgs). Total TPH-g also were detected in three soil samples (IC06SB028 at 16 and 16.5 feet bgs, and IC06SB029 at 20.5 feet bgs). The maximum detected concentration of total TPH-d (409 mg/kg) was detected in a soil sample collected 16 feet bgs at soil boring IC06SB028. The maximum detected concentration of total TPH-g (8.55 mg/kg) also was detected in boring IC06SB028 in a sample collected approximately 16.5 feet bgs. It should be noted that the total TPH-d result at this location was significantly less (a laboratory estimated ["J-flagged"] concentration of 4.47 mg/kg) than the TPH-d result for the 16-foot soil sample (409 mg/kg), indicating that the remaining petroleum hydrocarbon contamination is probably localized and very limited in extent. Total TPH-d concentrations remaining in soils near confirmation soil boring IC06SB029 and former soil boring IC06B006 (Figure 2.1) indicate that air injection bioventing has reduced TPH-d contamination in soils by 2 orders of magnitude. At IC06B006, pre-bioventing soil samples collected from 15.7 and 32.7 feet bgs had respective TPH-d concentrations of 3,700 and 1,500 mg/kg (Table 2.1 of Appendix A). In comparison, confirmation soil samples collected

TABLE 3.1
OCTOBER 1998 SOIL AND GROUNDWATER LABORATORY ANALYTICAL RESULTS
SA-6
McCLELLAN AFB, CALIFORNIA

Soil Boring	SBD[a] (feet bgs)	SED[b] (feet bgs)	TPH-d	TPH-g	Benzene	Toluene	Ethyl-benzene	Total Xylenes
			SW8015-modified		SW8021B			
Total Soil Results			(mg/kg)[c]	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
IC06SB026	23.0	23.5	3.17J[d]	<1.25[e]	<0.130	<0.130	<0.130	<0.130
IC06SB026	38.5	39.0	2.42J	<1.19	<0.123	<0.123	<0.123	<0.123
IC06SB026	40.0	40.5	3.1J	<1.2	<0.125	<0.125	<0.125	<0.125
IC06SB027	24.5	25.0	3.37J	<1.26	<0.132	<0.132	<0.132	<0.132
IC06SB027	41.5	42.0	3.37J	<1.17	<0.122	<0.122	<0.122	<0.122
IC06SB027	53.0	53.5	6.08J	<1.25	<0.130	<0.130	<0.130	<0.130
IC06SB028	16.0	16.5	409	3.79	<0.118	<0.118	<0.118	<0.118
IC06SB028	16.5	17.0	4.47J	8.55	<0.130	<0.130	<0.130	0.831
IC06SB028	35.0	35.5	7.21J	<1.19	<0.123	<0.123	<0.123	<0.123
IC06SB028	50.0	50.5	2.75J	<1.2	<0.125	<0.125	<0.125	<0.125
IC06SB029	19.0	19.5	15.6	<1.07	<0.111	<0.111	<0.111	<0.111
IC06SB029	20.5	21.0	4.65J	2.19	<0.116	<0.116	<0.116	<0.116
IC06SB029	32.5	33.0	56.5	<1.20	<0.125	<0.125	<0.125	<0.125
IC06SB029	62.0	62.5	2.43J	<1.22	<0.127	<0.127	<0.127	<0.127
IC06SB029	88.0	88.5	3.4J	<1.6	<0.167	<0.167	<0.167	<0.167
			California DI-WET					
Soluble Soil Results			(µg/L)[f]	(µg/L)				
IC06SB028	16.0	16.5	40J	<100				
IC06SB029	19.0	19.5	70J	---[g]				
IC06SB029	32.5	33.0	1,060	<100				
					SW8021B			
Groundwater Results					(µg/L)	(µg/L)	(µg/L)	(µg/L)
IC06SB029	WT[h]				<1.0	<1.0	<1.0	<1.0

[a] SBD = sample beginning depth in feet below ground surface.

[b] SED = sample ending depth in feet below ground surface.

[c] mg/kg = milligrams per kilogram.

[d] J = laboratory estimated value. The analyte was positively identified at a concentration between the practical quantitation limit (PQL) and the reporting limit (RL).

[e] < and gray shading = compound analyzed for, but not detected above the PQL. Number shown represents the RL.

[f] µg/L = micrograms per liter.

[g] --- = Not analyzed.

[h] WT = Hydropunch groundwater sample collected below the water table surface (which was at approximately 116 feet bgs during the sampling event).

from 19 and 32.5 feet bgs at IC06SB029 had total TPH-d concentrations of 15.6 and 56.5 mg/kg, respectively (Table 3.1). Total TPH-g was not detected in soil samples collected deeper than 20.5 feet bgs. While "nondetect" TPH-d results were not obtained for any soil samples, the laboratory estimated ("J-flagged") concentrations for samples collected deeper than 32.5 feet bgs did not exceed 7.21 mg/kg. For those soil samples containing total TPH above the laboratory RLs, soluble TPH analysis was performed in accordance with California DI-WET procedures. Other than the soluble TPH-d result for the soil sample collected 32.5 feet bgs at IC06SB029 (1,060 μg/L), the residual petroleum hydrocarbon contamination remaining in site soils appears to be relatively insoluble. At IC06SB028, where maximum concentrations of total TPH were detected in samples collected at approximately 16 feet bgs, soluble TPH was not observed above the laboratory RL. Soluble TPH-g was not detected in either soil sample analyzed by this method.

Little to no BTEX were observed in site soils following more than 4.5 years of pilot-scale bioventing system operation. Benzene, toluene, and ethylbenzene were not detected in any of the 15 confirmation soil samples (Table 3.1). Total xylenes measuring less than 1 mg/kg were detected in the sample collected at 16.5 feet bgs at IC06SB028. In comparison, BTEX concentrations of 4.2, 18, 14, and 27 mg/kg, respectively, were measured in soils collected 17.5 feet bgs from VMP1 during bioventing system installation in July 1993 (Table 2.1 of Appendix A). Confirmation soil sample results indicate that the BTEX constituents have been nearly completely biodegraded as a result of air injection bioventing at SA 6.

3.2 GROUNDWATER ANALYTICAL RESULTS

One groundwater Hydropunch® sample was collected at IC06SB029 following advancement of this soil boring to groundwater. No BTEX was detected in this sample (Table 3.1). The Hydropunch® sample was collected at this location because of pre-bioventing (March 1992) detections of benzene (310 μg/L), toluene (650 μg/L), ethylbenzene (130 μg/L), and xylenes (740 μg/L) in a groundwater Hydropunch® sample collected from nearby soil boring IC06B006 (Figure 2.1). Nondetect groundwater results for BTEX during the confirmation sampling event further verify the effectiveness of bioventing treatment of source area soils and probably indicate that petroleum hydrocarbon reductions in site groundwater are the result of natural attenuation.

3.3 COMPARISON TO REGULATORY GUIDELINES

No specific cleanup standards exist for petroleum hydrocarbon contaminated soils at McClellan AFB. Therefore, residual petroleum hydrocarbon concentrations remaining in site soils were further evaluated in accordance with California LUFT (California SWRCB, 1989) and DLM (California RWQCB, 1989) guidelines.

3.3.1 Comparison to LUFT Guidelines

The LUFT guidelines (California SWRCB, 1989) provide information pertaining to assessment, cleanup, and closure of sites where petroleum fuels have leaked from USTs and contaminated subsurface soils and/or groundwater. Because residual petroleum-hydrocarbon contaminated soils remaining at SA 6 are most prevalent between 15 and 40 feet bgs, contaminant leaching from soil to groundwater represents the most significant potential exposure pathway.

Table 2-1 of the LUFT guidelines (California SWRCB, 1989) presents a simplified methodology to assess the possible threat to groundwater from petroleum contaminated soils and provides maximum allowable BTEX and TPH soil concentrations that can be left in place without threatening groundwater. These allowable levels of soil contamination are provided based on consideration of various site features (e.g., depth to groundwater, fractures in the subsurface, average annual precipitation) used to estimate whether a low, medium, or high leaching potential exists at a site. The maximum allowable BTEX and TPH concentrations which can be left in place based on these leaching potential categories are shown in Table 3.2 along with the maximum detected BTEX and TPH soil results from the October 1998 confirmation sampling event.

Comparing maximum detected confirmation soil sample results to the maximum allowable BTEX and TPH levels shown in Table 3.2 indicates that site soils are likely to pose a threat to groundwater only if an evaluation of site features shows that a "high leaching potential" exists. Under this scenario, the maximum detected concentration of TPH-d (409 mg/kg) exceeds the maximum allowable TPH-d soil concentration (100 mg/kg). However, evaluation of site features and sample results against the criteria in Table 2-1 of the LUFT guidelines (California SWRCB, 1989) indicates that a "low leaching potential," or no greater than a "medium leaching potential," exists at SA 6 for the following reasons:

- Soils between 32.5 feet bgs and groundwater at approximately 116 feet bgs are minimally contaminated with petroleum hydrocarbons (no BTEX or TPH-g detects and no TPH-d detects exceeding 10 mg/kg) (Table 3.1);
- No subsurface fractures are present at the site;
- Average annual precipitation is less than 25 inches and the concrete/asphalt paved surface at the site acts to minimize infiltration of rainwater; and
- No man-made conduits or other conditions exist at the site which are expected to increase vertical migration of leachate.

Considering this assessment, residual petroleum hydrocarbon concentrations remaining in soils at SA 6 can be left in place without threatening groundwater.

TABLE 3.2
COMPARISON OF TPH AND BTEX IN SOIL TO CALIFORNIA LUFT LEACHING CRITERIA
SA-6
McCLELLAN AFB, CALIFORNIA

Leaching Potential Category	TPH-d (mg/kg)[a/]	TPH-g (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)
Maximum Allowable Soil Concentrations [b/]						
Low	10,000	1,000	1.0	50	50	50
Medium	1,000	100	0.3	0.3	1.0	1.0
High	100	10	ND[c/]	ND	ND	ND
Maximum Detected Site Soil Concentrations						
	409	8.55	<0.167[d/]	<0.167	<0.167	0.831

[a/] mg/kg = milligrams per kilogram.

[b/] Maximum allowable analyte concentration that can be left in place without threatening groundwater (California SWRCB, 1989).

[c/] ND = no detectable levels of BTEX are allowed (California SWRCB, 1989).

[d/] < and gray shading = compound analyzed for, but not detected above the practical quantitation limit (PQL). Number shown represents the reporting limit (RL).

3.3.2 Comparison to DLM Guidelines

The DLM guidelines (California RWQCB, 1989) provide a means to evaluate the soluble concentration of a contaminant against a designated level (DL) expected to be protective of the beneficial use(s) of groundwater considering environmental fate of the contaminant. Because no soluble TPH-g and essentially no BTEX was detected in SA 6 soils, the DLM was used to evaluate whether soluble TPH-d concentrations remaining in site soils present a significant threat to site groundwater.

A Soluble DL for TPH-d can be established using the following equation (California RWQCB, 1989):

Soluble DL = WQG x EAF x DF

Where:

WQG	=	Water Quality Goal for TPH-d
EAF	=	Environmental Attenuation Factor
DF	=	Dilution Factor (1/10 for the DI-WET Method)

In accordance with the DLM (California RWQCB, 1989), the WQG for a contaminant should be selected to protect the maximum number of beneficial uses, and as a result, the most restrictive (i.e., lowest) applicable and justifiable water quality criterion is recommended. For the protection of groundwater, the California RWQCB (1998) has identified a WQG of 100 μg/L for diesel oil based on taste and odor.

The EAF is used to approximate the degree of contaminant reduction that will occur as a result of natural environmental fate processes including adsorption, volatilization, dilution, dispersion, and chemical or biochemical degradation. The amount of environmental attenuation occurring at a site varies with site-specific hydrogeologic and pollutant characteristics including, but not limited to, depth to groundwater, net recharge, vadose zone permeability and clay content, total pollutant loading and pollutant sorption, solubility, and biodegradability. The greater the degree of expected attenuation from these processes, the larger the EAF used. According to the DLM, a "generic" EAF of 100 should be used for deriving DLs in those situations which provide an "average" degree of natural protection for water quality from the discharge of wastes under reasonable worst-case conditions. At the very least, an "average" degree of groundwater protection from petroleum migration is afforded by site and contaminant characteristics following more than 4.5 years of bioventing treatment.

Using the soluble DL equation, a WQG of 100 μg/L for diesel oil, and the "generic" EAF of 100, a soluble DL for TPH-d contamination can be determined:

TPH-d soluble DL = 100 μg/L x 100 x 1/10

= 1,000 μg/L

Under these assumptions, soils analyzed using the DI-WET method will meet the soluble DL for petroleum hydrocarbons as diesel if their soluble TPH-d concentration is equal to, or less than, 1,000 μg/L.

Based on the confirmation sample results shown in Table 3.1, total TPH-d was only detected above laboratory RLs in 3 of the 15 samples (IC06SB028 at 16 feet bgs and IC06SB029- at 19 and 32.5 feet bgs). Soluble TPH-d results indicate that the calculated cleanup level of 1,000 μg/L is only slightly exceeded by the soil sample collected 32.5 feet bgs at IC06SB029 (1,060 μg/L). Soluble TPH-d concentrations for the other two soil samples are well below the calculated DL.

While the soluble TPH-d concentration for the soil sample collected 32.5 feet bgs at IC06SB029 slightly exceeds the calculated DL, the 100-fold attenuation factor (EAF) for TPH-d contamination remaining in site soils appears to be very conservative. The actual attenuation of TPH-d occurring in site soils is likely to be greater than "average" considering the:

- Soil sample results (TPH contamination above laboratory RLs was not observed in soils deeper than 32.5 feet bgs);
- Depth to groundwater (greater than 100 feet bgs);
- Site lithology (predominantly low permeability silts and clays between 30 and 100 feet bgs);
- High natural oxygen content of subsurface soil vapor following 4.5 years of bioventing treatment (Table 2.1); and
- Demonstrated biodegradation potential at the site (Table 2.1).

It should also be noted that the presence of a concrete/asphalt paved surface at the site minimizes infiltration (recharge) of rainwater, a potentially significant driving force for contaminant migration.

3.4 SESOIL MODELING EVALUATION

At the request of the California RWQCB (1999) SESOIL modeling has subsequently been conducted for the site. The objective of the SESOIL modeling was to demonstrate that remaining soil contamination at the site does not pose a threat to groundwater, located more than 100 feet bgs at the site.

3.4.1 Model Description and Setup

The SESOIL (Seasonal Soil Compartment Model) model is a one-dimensional vertical transport model for the unsaturated zone. It estimates pollutant concentrations in the soil profile and simulates hydrologic (e.g., rainfall, infiltration) and pollutant transport processes (e.g., volatilization, biodegradation, adsorption). SESOIL Version

2.50 developed as part of the RISKPRO software package (General Sciences Corp., 1995) was used for the modeling at SA 6.

The input parameters used in the SESOIL model for SA 6 were identical to those provided by McClellan AFB as guidance for SESOIL modeling at the base. These parameters are summarized in Table 3.3. The SESOIL model was initially run with these input parameters, baseline soil concentrations (100 mg/kg), and the range of biodegradation rates (none, and 0.0075 to 0.015 per day) to compare output results and confirm model calibration.

3.4.2 Model Results

Site-specific SESOIL modeling at SA 6 consisted of three separate model runs, one each for TPH-g, TPH-d, and xylenes, which were the contaminants detected in soil at SA 6 during the October 1998 sampling. The maximum soil contaminant concentrations for TPH-g, TPH-d, and xylenes measured during the soil sampling conducted in October 1998 were substituted for the baseline soil concentrations used during model calibration. These concentrations are provided in Table 3.4.

It was considered overly conservative not to include some degree of biodegradation in the model since bioventing has been shown to be an effective treatment technology at the site and sufficient oxygen has been shown to be available in the subsurface at the site, especially in the deeper vadose zone below 40 feet bgs. To be conservative, the lowest rate from the McClellan AFB guidance was used for each model run (0.0075 day^{-1} or a half-life of 92 days).

Model results are shown in Table 3.4 and on Figure 3.1. A diskette with the full input and output files for all three model runs is provided as Appendix E. As indicated in Table 3.4 and on Figure 3.1, none of the three model runs resulted in contaminant concentrations in soil moisture which exceeded their respective taste and odor thresholds at depths near groundwater (located more than 100 feet bgs or more than 85 feet below the depth of maximum contaminant concentrations in soil at SA 6).

3.5 DISCUSSION

The confirmation soil vapor, soil, and groundwater data presented in Sections 2.1, 3.1, and 3.2 suggest that petroleum hydrocarbon contaminated soils at SA 6 have been effectively remediated and will not benefit significantly from continued bioventing treatment. While some low level petroleum hydrocarbon contamination remains in soils underlying the former USTs, particularly between 15 and 35 feet bgs, soil results indicate that little to no BTEX remains in soils and that most of the remaining petroleum hydrocarbon contamination is relatively insoluble. Below the 35-foot depth interval, minimal petroleum contamination and high static oxygen concentrations are evident. This occurrence suggests that a large aerobic soil "buffer zone" exists and residual petroleum hydrocarbon contaminants migrating into this zone will be aerobically biodegraded. In addition, SVE activities at IC 7 have been shown to

TABLE 3.3
SESOIL MODEL INPUT PARAMETERS
SA-6
McCLELLAN AFB, CALIFORNIA

Model Input Parameter	Value(s)
Thickness of Vadose Zone	100 feet
Number of Soil Layers	4
Thickness of Each Soil Layer	25 feet
Number of Sublayers	5 sublayers for top 2 layers (i.e., 5 feet thickness each) 10 sublayers for bottom 2 layers (i.e.. 2.5 feet thickness each)
Soil Data	General Soil McClellan AFB (see below)
Application Area	10,000 cm^2 (11 ft^2)
Application Data Time Period	2 years
Pollutant Loading	Instantaneous in the first sublayer of the top soil layer
Model Run Time Period	200 years
Climate Data	Sacramento FAA AP (see below)
Chemical Data	TPH-g modeled as ethylbenzene; TPH-d modeled as naphthalene
Liquid Phase Biodegradation Rate	0.0075 to 0.015 day^{-1} (range)
General Soil McClellan AFB Parameters	
Soil Density	1.4 g/cm^3
Intrinsic Permeability	4.0×10^{-9} cm^2
Disconnectedness Index	8.0
Porosity	0.35
Organic Carbon Content	0.071 %
Cation Exchange Capacity	0.00 meq/100g dry soil
Freundlich Exponent	1.00

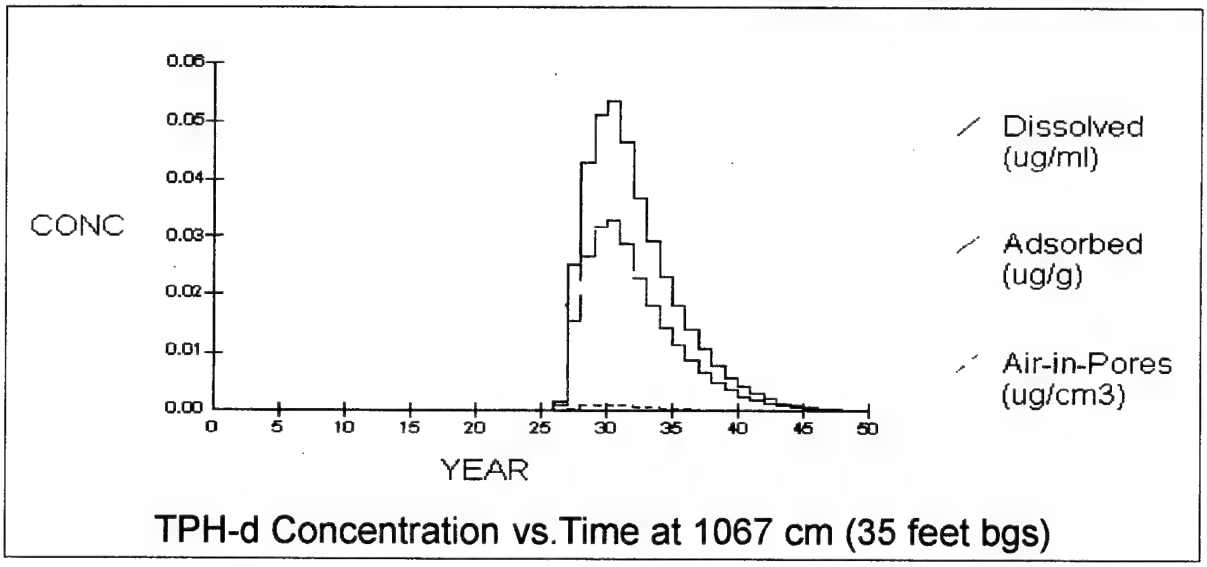
Sacramento Airport Climate Data

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
Air Temperature (deg C)	14.50	8.89	5.28	4.39	6.39	8.00	11.28	15.06	19.00	22.67	21.67	19.50
Cloud Cover Fraction (-)	0.40	0.65	0.75	0.75	0.65	0.65	0.60	0.55	0.40	0.20	0.25	0.30
Relative Humidity (-)	0.60	0.70	0.80	0.75	0.70	0.70	0.60	0.60	0.50	0.40	0.45	0.50
Albedo (-)	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Evapotranspiration (cm/day)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Precipitation (cm)	2.50	6.36	7.77	10.25	7.24	6.16	3.47	0.81	0.28	0.12	0.17	0.79
Mean Rain Time (days)	0.33	0.52	0.74	0.74	0.60	0.51	0.51	0.23	0.082	0.059	0.072	0.14
Mean Number of Storms	1.47	3.69	4.47	5.29	4.43	4.89	2.69	0.89	0.37	0.09	0.22	0.72
Mean Rainy Season (days)	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40

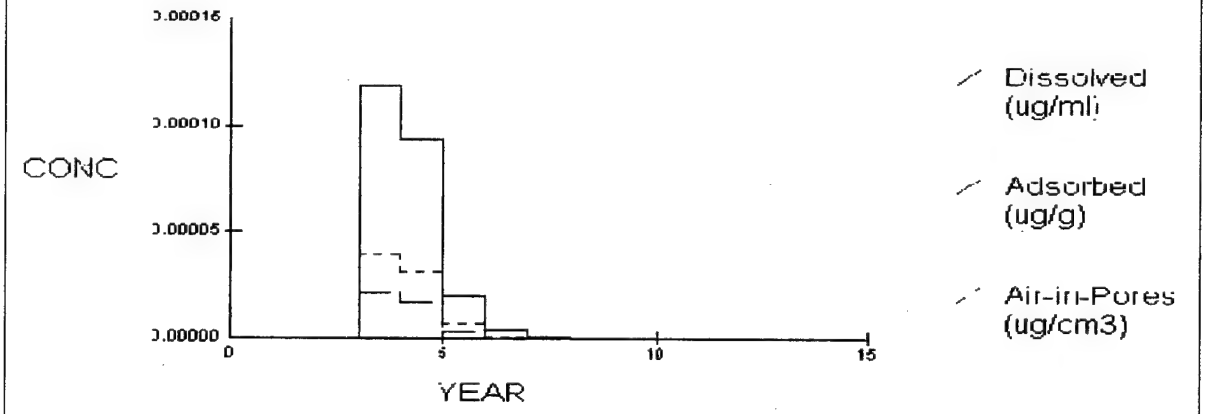
TABLE 3.4
SESOIL MODEL RESULTS
SA-6
McCLELLAN AFB, CALIFORNIA

Contaminant	Maximum Concentration in Soil (mg/kg) [a/]	First-Order Biodegradation Rate (day^{-1})	Taste and Odor Threshold [b/] (µg/L) [c/]	Maximum Depth of Contamination Exceeding Threshold in Soil Moisture (feet bgs)
TPH-d	409	0.0075	100	35
TPH-g	8.55	0.0075	5	10
Xylenes	0.831	0.0075	17	10

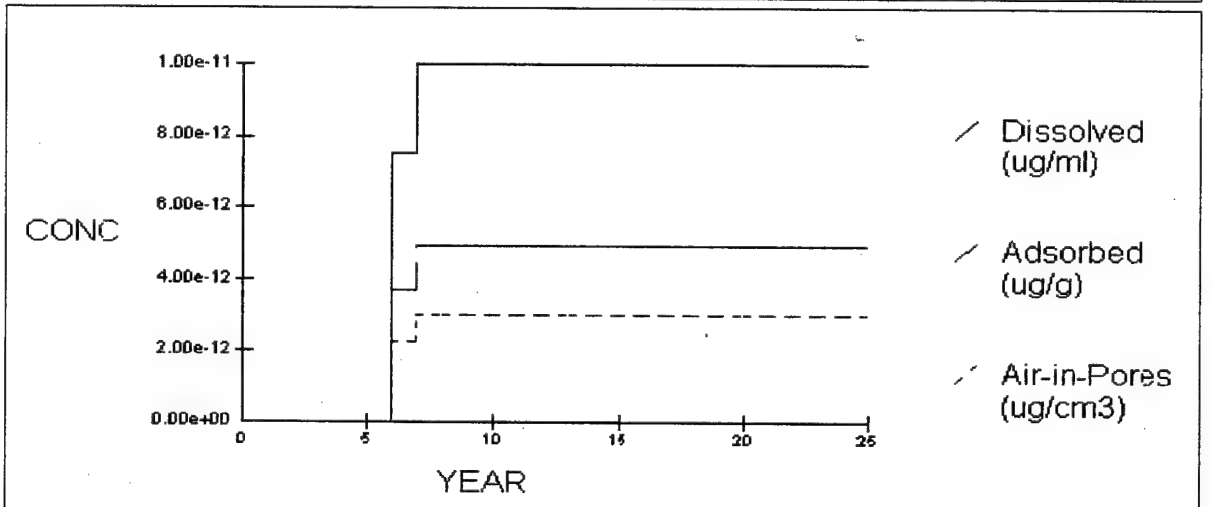
[a/] mg/kg = milligrams per kilogram.
[b/] California RWQCB, 1998.
[c/] µg/L = micrograms per liter.



TPH-d Concentration vs.Time at 1067 cm (35 feet bgs)



TPH-g Concentration vs.Time at 305 cm (10 feet bgs)



Xylenes Concentration vs.Time at 305 cm (10 feet bgs)

FIGURE 3.1

SESOIL MODEL RESULTS
Site SA 6

McClellan AFB, California

influence soil vapor movement at SA 6 and continued operation will help support maintenance of the high oxygen concentrations in site soils.

Comparison of residual petroleum hydrocarbon concentrations to California LUFT (California SWRCB, 1989) and DLM (California RWQCB, 1989) guidelines suggests that contaminant concentrations in soil have been adequately reduced and no longer threaten groundwater. This conclusion is supported by the nondetect BTEX results observed in site groundwater during the confirmation sampling event.

The site-specific SESOIL modeling results for SA 6 indicate that it is unlikely that the relatively low concentrations of contaminants which remain in the shallow soils at SA 6 will impact groundwater beneath the site.

SECTION 4

CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

Confirmation soil, soil vapor, and groundwater sample results suggest that petroleum contamination in site soils has been substantially reduced as compared to pre-bioventing data and site soils will not benefit significantly from further treatment. At most locations, static oxygen concentrations in contaminated soils are at, or near atmospheric levels, and are sufficient to support aerobic biodegradation of any remaining petroleum hydrocarbon contamination. Soil concentrations of BTEX have been reduced to nondetect or near nondetect levels. While some low level petroleum hydrocarbon contamination is present in site soils, especially between 15 and 35 feet bgs, the contaminants are relatively insoluble and unlikely to migrate to site groundwater, which is located greater than 100 feet bgs. Low permeability soils between 30 and 100 feet bgs and the presence of an asphalt/concrete paved surface at the site further reduce the potential for contaminant migration to groundwater. Nondetect BTEX results for site groundwater confirm that the groundwater threat now posed by SA 6 soils is minimal, at most. SESOIL modeling results indicate that while TPH-d, TPH-g, and xylenes were detected in site soils approximately 17 feet bgs, these contaminants do not pose a threat to site groundwater located more than 100 feet bgs.

4.2 RECOMMENDATIONS

Confirmation sample results following more than 4.5 years of bioventing treatment support the recommendation for NFI status for SA 6. Modeling results further support this recommendation. Once the NFI status has been granted by the local regulatory agencies, it is recommended that the bioventing system be shut down, and that McClellan AFB make arrangements for the VWs and VMPs to be properly abandoned in accordance with Department of Water Resources (DWR) standards. The bioventing blower system and shed should be dismantled and removed from the site. Because the blower system and shed are government/McClellan AFB property, they can be used at other sites. Lastly, the underground air injection piping at SA 6 should be capped at both ends and properly abandoned in place.

SECTION 5

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APPENDIX A
SAMPLING AND ANALYSIS PLAN

FINAL

Sampling and Analysis Plan To Support Recommendation for No Further Investigation at SA 6

McCLELLAN AIR FORCE BASE, CALIFORNIA

Prepared for

Air Force Center for Environmental Excellence
Brooks Air Force Base, Texas

and

Environmental Management
McClellan Air Force Base, California

February 1998

Prepared by

PARSONS ENGINEERING SCIENCE, INC.
2101 WEBSTER STREET, SUITE 700, OAKLAND, CA 94612 • 510/891-9085
OFFICES IN OTHER PRINCIPAL CITIES
726876.36

Final

SAMPLING AND ANALYSIS PLAN TO SUPPORT RECOMMENDATION FOR NO FURTHER INVESTIGATION

at

SA 6

McCLELLAN AIR FORCE BASE, CALIFORNIA

Prepared for

Air Force Center For Environmental Excellence
Brooks AFB, Texas
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SECTION 1

INTRODUCTION

This Sampling and Analysis Plan (SAP) presents the proposed scope of work to be conducted at Study Area 6 (SA 6) at McClellan Air Force Base (AFB), Sacramento County, California. SA 6 is the former location of a gasoline service station where a bioventing system has been treating contaminated vadose zone soils since September 1993. This SAP is intended to satisfy the recommendation made in the Remedial Investigation Characterization Summary (RICS) for the SA 6 source area, which was to evaluate the effectiveness of bioventing for remediating the volatile organic compounds (VOCs) and total petroleum hydrocarbons (TPH) contamination in soil (Radian, 1995). It is anticipated that the analytical results from the proposed sampling will support a no further investigation (NFI) recommendation for the site. This final SAP incorporates responses to comments received from the California Regional Water Quality Control Board, Central Valley Division, to a draft version of this SAP (Appendix B).

Since 1992, McClellan AFB has participated in the U.S. Air Force Bioventing Initiative, sponsored by the Air Force Center for Environmental Excellence (AFCEE) at Brooks AFB, Texas in cooperation with the Air Force Armstrong Laboratory and the U.S. Environmental Protection Agency (USEPA). The initiative included conducting approximately 145 bioventing pilot tests at 56 Air Force installations throughout the country. These tests were designed to collect data on the effectiveness of bioventing for the remediation of soil contaminated with fuel hydrocarbons (e.g., jet fuel, diesel fuel, gasoline, heating oil).

Bioventing pilot tests were completed as part of the Bioventing Initiative at 5 sites at McClellan AFB, including SA 6, and one site at the Davis Global Communications Site in Davis, California (ES, 1994; Parsons ES, 1996). One site, Potential Release Location (PRL) T-18 (also known as Tank Farm #4) has already received NFI status (Parsons ES, 1997; California RWQCB, 1997). Results from the RICS and bioventing system operations at SA 6 were reviewed during preparation of this SAP.

This SAP consist of seven sections, including this introduction, and one Appendix. Section 2 includes site descriptions, histories, and summaries of previous investigations and remediation activities. Section 3 includes the proposed SAP. Section 4 provides a discussion of the criteria that will be used to support a NFI recommendation for the site. Analytical results from the sampling activities and recommendations will be presented in a Letter Report as described in Section 5. A proposed schedule for the sampling activities and submittal of the Letter Report is included in Section 6. Section 7 provides references cited in this SAP. Appendix A includes a Quality Assurance Project Plan Applicability Checklist and Applicability Statement.

SECTION 2

SITE DESCRIPTION AND HISTORY

2.1 SITE LOCATION AND HISTORY

2.1.1 McClellan AFB

McClellan AFB, an Air Logistics Center for the U.S. Air Force, is located approximately 7 miles northeast of downtown Sacramento and covers approximately 3,000 acres (Figure 2.1). The Base was established in 1936 as the Sacramento Air Depot and is currently the largest industrial employer in Northern California, employing approximately 13,000 civilian and military personnel. As part of its historic and recent mission, the Base provided logistics support for aircraft, weapons systems, communications equipment, and commodity items as well as maintenance, supply, and contracting services. As part of 1995 Base Realignment and Closure (BRAC) activities, the decision was made to close McClellan AFB in 2001 and privatize the mission workload. Past operations have generated various hazardous and toxic wastes, including: industrial solvents, caustic cleaners, electroplating chemicals, heavy metals, polychlorinated biphenyls (PCBs) low-level radioactive wastes, and a variety of fuel oils and lubricants.

Hazardous wastes were disposed of at a variety of burial pits, sludge pits, and miscellaneous disposal trenches and pits. In 1979, groundwater contamination was discovered and subsequently base production wells were shut down. Since that time, base production wells have been retrofitted with well head treatment systems, numerous monitoring wells (MWs) have been installed, and six groundwater extraction systems have been installed to prevent migration of contaminants.

Numerous environmental investigations have been performed throughout McClellan AFB as part of the U. S. Air Force (USAF) Installation Restoration Program (IRP) and an Interagency Agreement (IAG) between state and federal agencies. Possible sources of contamination at McClellan AFB identified in prior studies are grouped by geographic area, designated as Operable Units (OU) A through H (Figure 2.2). Each OU was further broken down into geographic investigation clusters (IC) comprised of multiple sites. Sites within each IC are generally referred to by their IRP descriptor and number (e.g., CS 10). The most common IRP descriptors used are: SA (Study Area), PRL (Potential Release Locations), SSA (Special Study Area), CS (Confirmed Site), and AOC (Area of Concern). An additional OU separately addresses groundwater contamination (GWOU).

2.1.2 SA 6

SA 6 is located in the southwestern portion of the base within OU B (Figure 2.2), south of Building 656 and west of Building 655 (Figure 2.3). The site is the former location of a

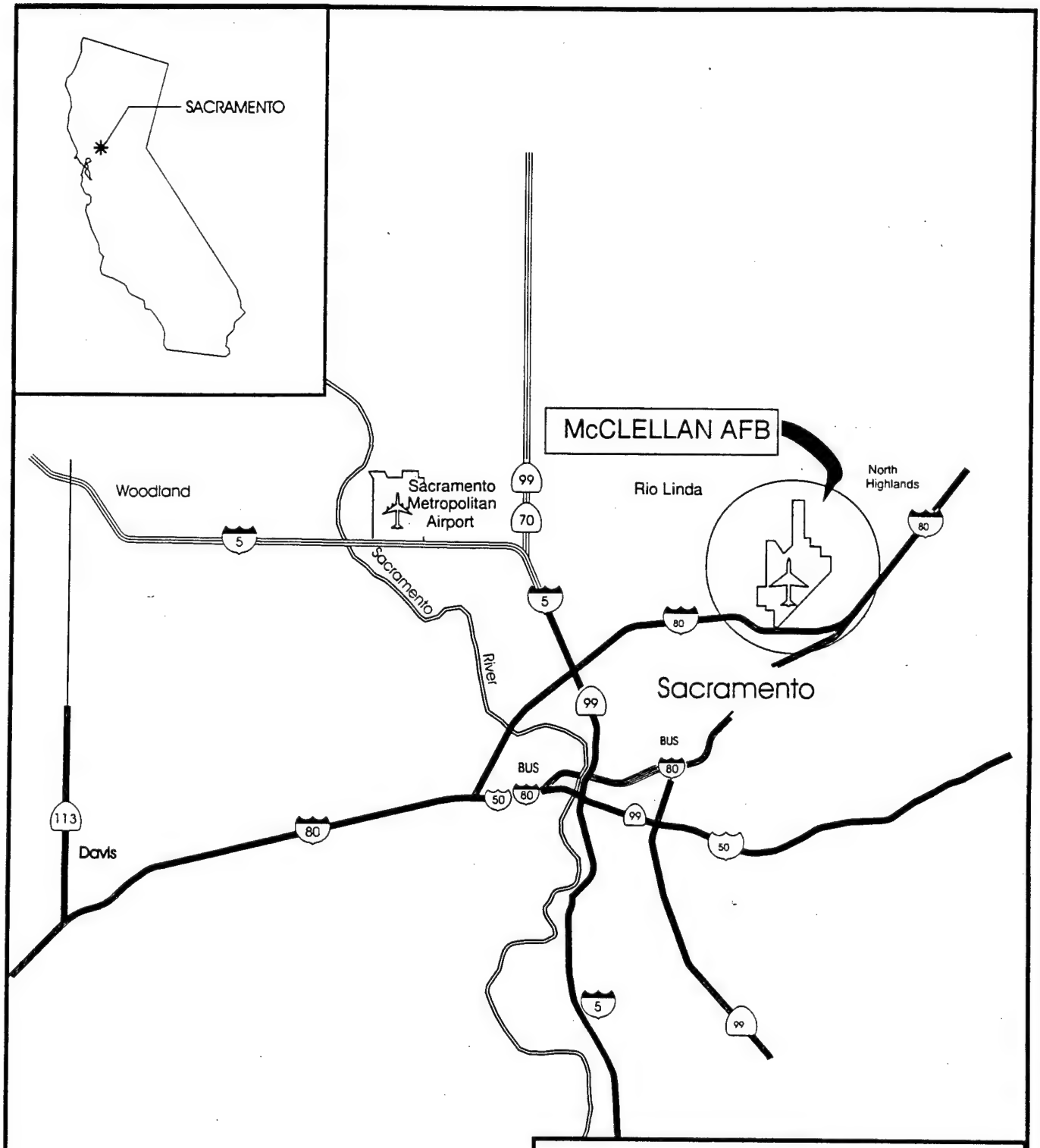

FIGURE 2.1

FACILITY LOCATION

McClellan AFB, California

PARSONS ENGINEERING SCIENCE, INC.

Oakland, California

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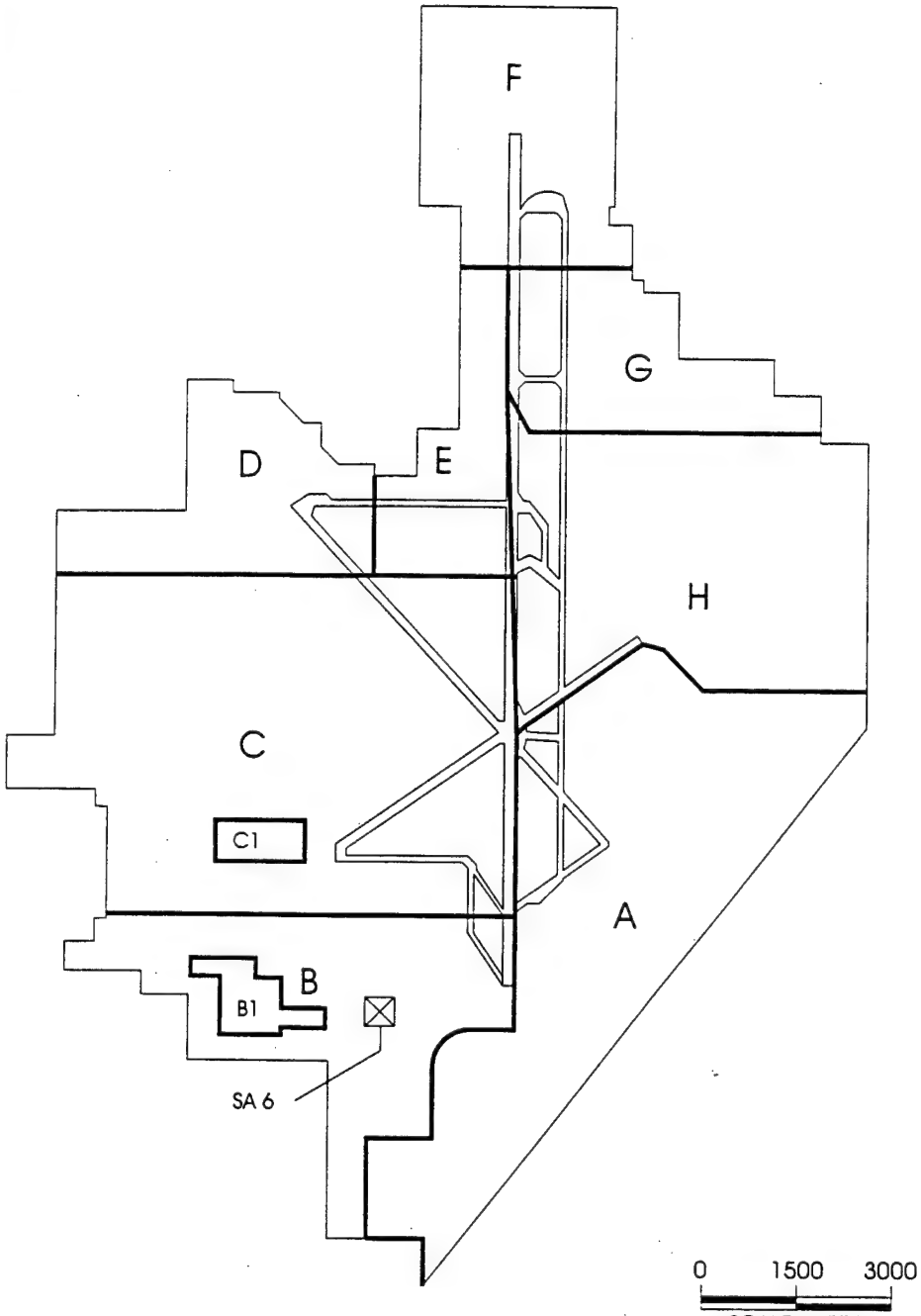


EXPLANATION

BOUNDARIES OF OPERABLE UNITS

McCLELLAN AFB BOUNDARY

FIGURE 2.2

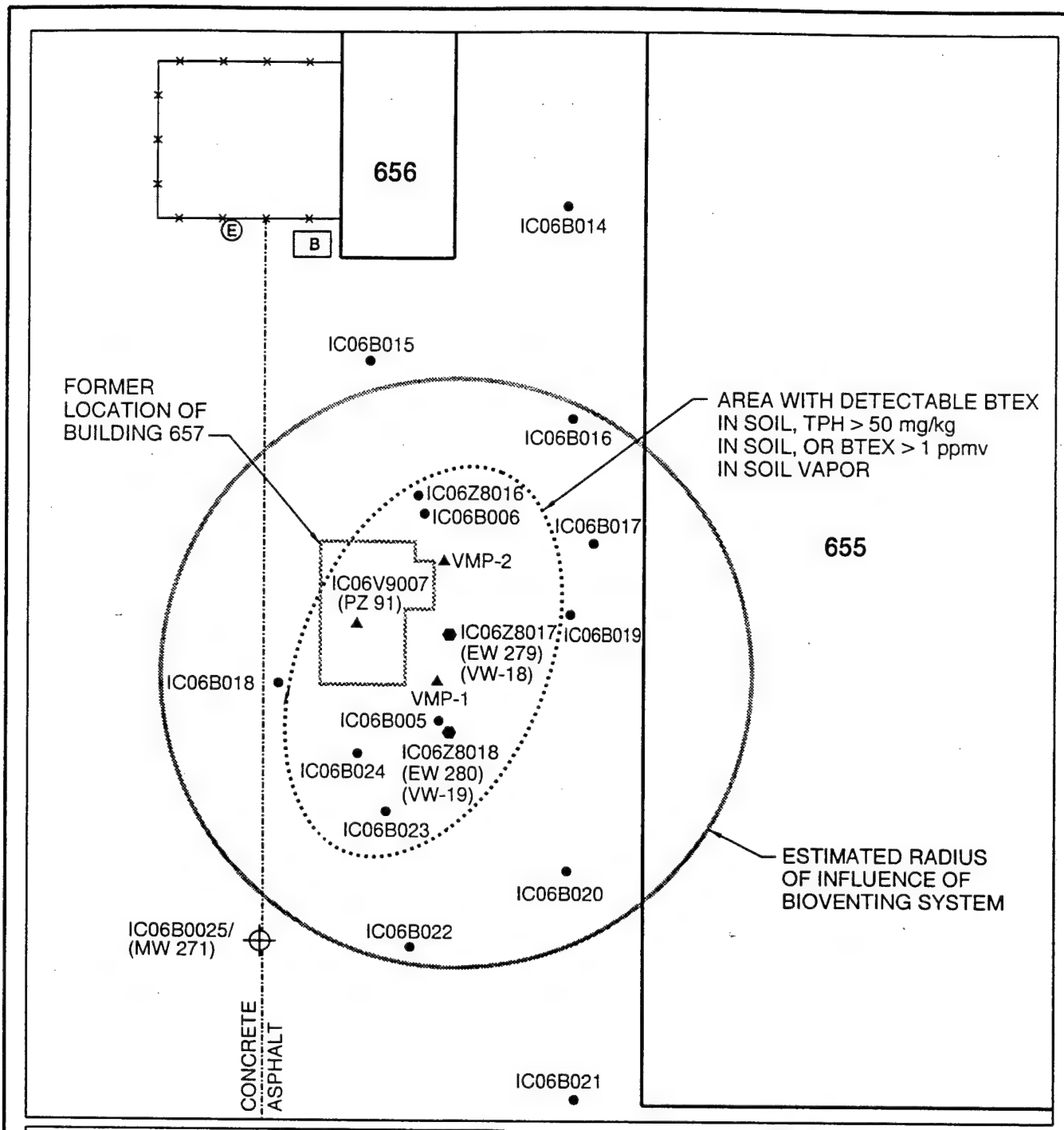
APPROXIMATE BOUNDARIES OF OPERABLE UNITS AND LOCATION OF SA 6

McClellan AFB, California

PARSONS ENGINEERING SCIENCE, INC.

Oakland, California

\726876\36\SA6\GRAPHICS\SA6.CDR 9/20/97



EXPLANATION

656	BUILDING
	CONCRETE/ASPHALT BORDER
E	ELECTRIC POWER JUNCTION
B	BLOWER LOCATION
IC06B022	PREVIOUS SOIL BORING
EW 279	EXISTING VENT WELL
VMP-1	EXISTING VAPOR MONITORING POINT (PIEZOMETER)
MW-271	GROUNDWATER MONITORING WELL
	FENCE

N

0 25 50

SCALE IN FEET

FIGURE 2.3
SITE MAP AND PREVIOUS SAMPLING LOCATIONS
SA 6
McCLELLAN AFB, CALIFORNIA

PARSONS ENGINEERING SCIENCE, INC.

Oakland, California

REV. 4 MCCL-003.DWG 02/23/98

gasoline service station (Building 657) and its associated underground storage tanks (USTs) located east of the building. The site is currently near the center of a large, paved parking lot.

The former service station operated from 1955 until 1990. The two gasoline USTs and two diesel USTs which supplied the station were removed in 1990 and 1991. Initial investigations conducted by the Base determined that the USTs had leaked and contaminated the soil. Subsequent investigations more fully characterized the extent of the contamination (Radian, 1995).

During RI activities conducted in February 1993, two soil borings were converted to vent wells (VWs), also referred to as extraction wells (EWs), and one soil boring was converted to a vapor monitoring point (VMP), also referred to as a piezometer (PZ). The official designations used for the two VWs were EW279 and EW280, although previous reports have also referred to them as VW-18 and VW-19, respectively. The official designation used for the VMP was PZ91, although previous reports also referred to it as VPN-20.

In July 1993, two additional VMPs (VMP-1 and VMP-2) were constructed and in September 1993 an air injection bioventing system using both EW279 and EW280 began operation (ES, 1994). Except for periods when the system was shut down for respiration testing, collection of confirmatory soil samples, and/or maintenance, the system has operated continuously since 1993. Sampling results from previous investigations and bioventing system installation and testing are discussed in Section 2.3.

2.2 GEOLOGY AND HYDROGEOLOGY

2.2.1 McClellan AFB

McClellan AFB is located in the Sacramento Valley, a deep trough of sediments primarily derived from the erosion of the Sierra Nevada mountains to the east. These alluvial and fluvial sediments were frequently eroded and redeposited by local streams. Meandering and abandonment of stream channels have produced complex regional and local stratigraphy dominated by lenses of material with little lateral or vertical continuity.

Regionally, soils are mostly fine-grained, but approximately 25 to 30 percent of the deposits are sand and gravel. Soils in the vicinity of the base are extremely variable, but are generally classified as fine, sandy loams. These soils have low shrink-swell potential and generally low soil permeabilities, varying locally. Due to the extreme variability of soils, extrapolation of lithologic units identified from boring logs at horizontal distances greater than 100 feet is difficult.

The alternating layers of channels, overbank deposits, backwater deposits, sand bars, and widespread flood deposits today form an aquifer system that is extremely variable in nature over short distances, but broadly interconnected. This aquifer system has been divided into 5 zones for purposes of groundwater monitoring, which are designated A though E, from shallowest to deepest. Within OU B, the groundwater is typically encountered between 100 and 120 feet below ground surface (bgs) (Radian, 1996). The water table has declined between 0.09 and 2.0 feet each year between 1955 and 1985. Groundwater levels are

expected to continue to decline because of overdrafting of the local groundwater aquifers by irrigation, supply, and extraction wells.

The aquifer zones are not hydraulically independent and groundwater can flow vertically between them. Horizontal groundwater movement in each zone is generally in a south-southwest direction, toward a regional pumping depression south of Sacramento. South and west of McClellan AFB numerous active private and public water supply wells influence the immediate subregional groundwater flow; therefore, groundwater flow directions on the base are dependent on location. The groundwater extraction systems installed at McClellan AFB during the 1980s also exert some local hydraulic control in the shallow aquifer zones.

A contaminant smear zone of residual and gaseous phase contaminants exists in the lower vadose zone due to changes in flow direction and the declining water table (Jacobs, 1995). As groundwater levels declined, contaminant residuals have re-partitioned to the vadose zone as gases and some contaminants have remained adsorbed onto soil particles.

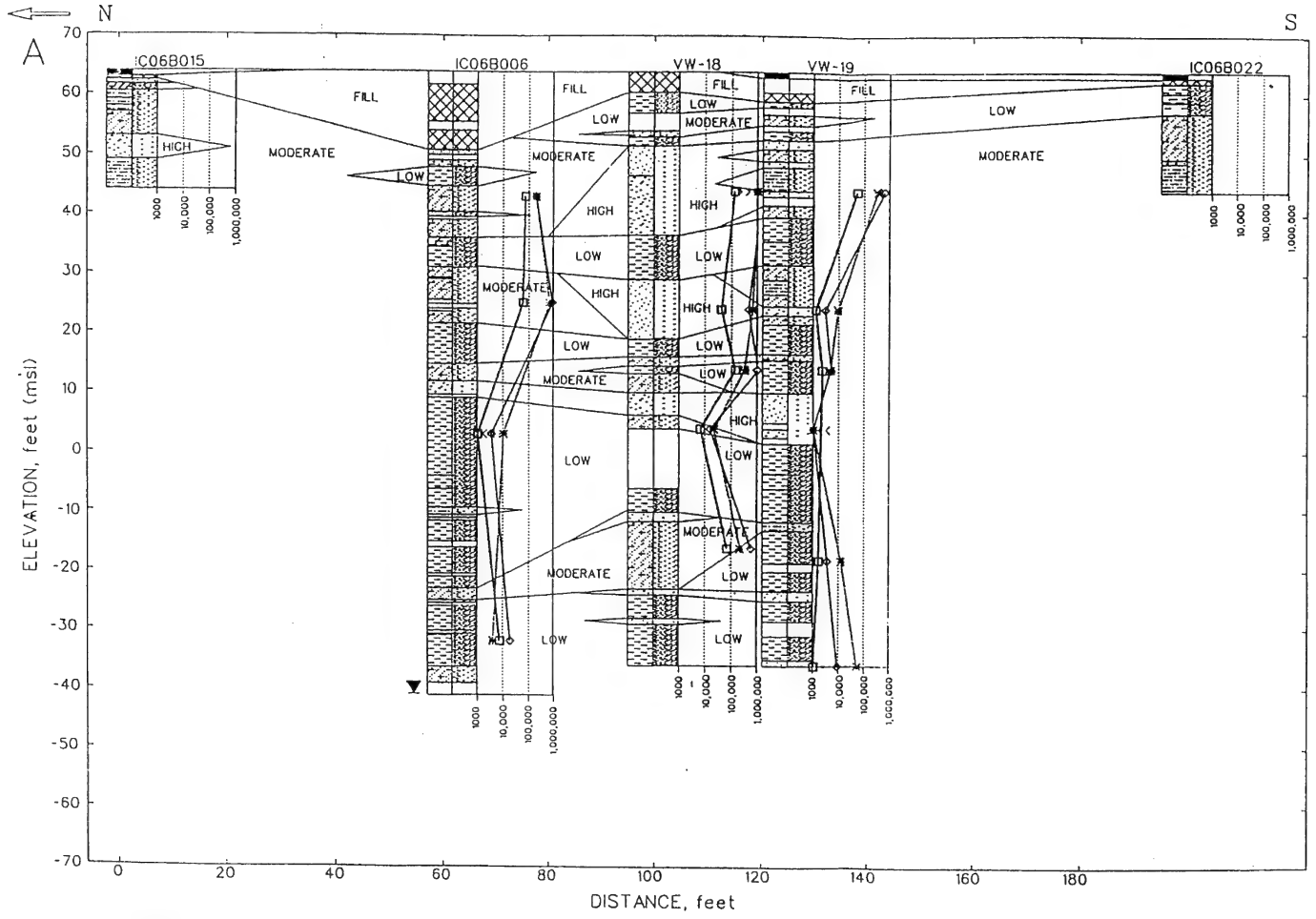
2.2.2 SA 6

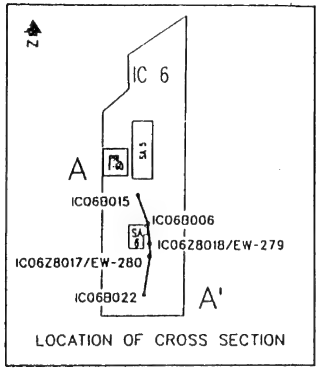
The subsurface geology has been interpreted from borings advanced during RI activities and borings advanced during installation of the bioventing system (Radian, 1995; ES, 1994). The subsurface has been logged to the top of the water table (approximately 100 to 110 feet) at several site locations. Cross-sections from the RICS are shown on Figures 2.4 and 2.5.

Silty clay fill underlies a portion of the site from near ground surface to depths of approximately 5 to 14 feet bgs. The thickest section of fill was penetrated in boring IC06B006, located near the northeast corner of the former service station. Outside of the fill area, the upper 20 to 30 feet are predominantly fine sand and silty sand of moderate to high permeability interbedded with thin layers of low permeability silt and clay. From approximately 30 feet to 100 feet bgs, primarily lower permeability silt, clayey silt, and silty clay has been encountered. However, several thick sand lenses were encountered at depths of 50 to 70 feet and 74 to 88 feet bgs in the borehole advanced for EW279.

Depth to groundwater in the A monitoring zone at the site is approximately 104 feet bgs and generally flows toward the south-southwest (Radian, 1995). Based on groundwater elevation measurements made in the Third Quarter of 1997 (Figure 2.6), the local groundwater gradient is approximately 0.008 foot/foot. The local groundwater flow and gradient are influenced by pumping at Base Well 18 (BW-18) and Extraction Well 304 (EW-304), located approximately 600 feet southwest and 300 feet northwest of SA 6, respectively. Across the Base, groundwater seepage velocities typically range from 0.01 to 1.3 feet/day in the A monitoring zone. In the vicinity of SA 6, the groundwater seepage velocity is expected to be near the upper end of this range due to the influence of pumping at EW-304 and BW-18.

The groundwater capture zone created by groundwater extraction from EW-304 and BW-18 encompasses groundwater beneath SA 6, as shown by the groundwater elevation contours and capture zone delineations on Figure 2.6 (Radian, 1997b). Therefore, any contamination reaching groundwater from contaminant sources at SA 6 would ultimately be treated as long as groundwater extraction and treatment from EW-304 and/or BW-18 continues.





LITHOLOGY:

- NO RECOVERY
- FILL
- CLAY
- SILTY CLAY
- SANDY SILTY CLAY
- SANDY CLAY
- SILT
- CLAYEY SILT
- SANDY CLAYEY SILT
- SANDY SILT
- CLAYEY SANDY SILT
- SAND
- CLAYEY SAND
- SILTY CLAYEY SAND
- SILTY SAND
- CLAYEY SILTY SAND

PERMEABILITY GROUPS:

LOW — FINE-GRAINED MATERIALS: SILT, CLAY SANDY SILT OR CLAY, GRAVELLY SILT OR CLAY, LEAN AND FAT CLAY, SILTY CLAY, AND CLAYEY SILT

MODERATE — MEDIUM-GRAINED MATERIALS: SILTY OR CLAYEY SAND OR GRAVEL

HIGH — COARSE-GRAINED MATERIALS: POORLY GRADED OR WELL GRADED SAND OR GRAVEL WITH LESS THAN 5% FINES

CONTAMINANTS OF CONCERN (ppbv)

- o-xylenes
- Benzene
- Toluene

▼ APPROXIMATE WATER LEVEL ELEVATION

<< CONCENTRATION IS LESS THAN 1,000 ppbv

>> CONCENTRATION IS GREATER THAN 1,000,000 ppbv

NOTE: CORRELATION OF PERMEABILITY GROUPS IS CONCEPTUAL

SOURCE: Radian, 1995

FIGURE 2.4

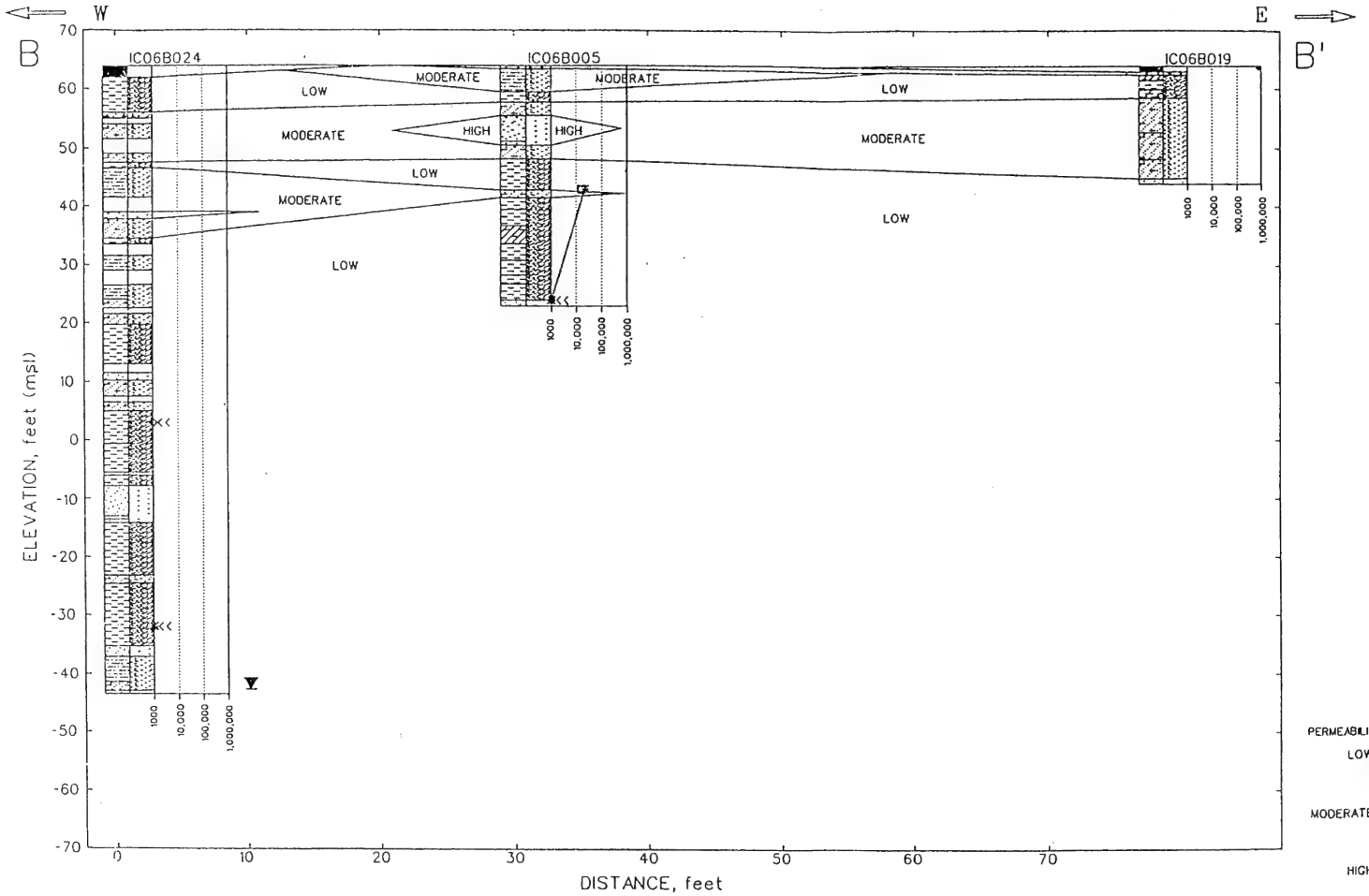
CONCEPTUAL CROSS-SECTION A-A' THROUGH IC 6

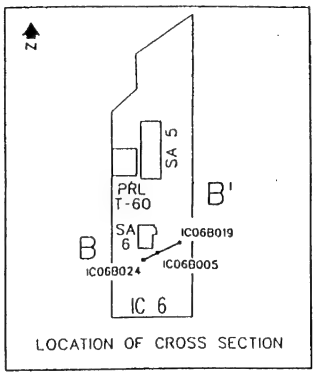
McClellan AFB, California

PARSONS ENGINEERING SCIENCE, INC.

Oakland, California

\726876\36\SA6\WORKPLAN\FIGS_L11.CDR 9/30/97





LITHOLOGY:

- NO RECOVERY
- FILL
- CLAY
- SILTY CLAY
- SANDY SILTY CLAY
- SANDY CLAY
- SILT
- CLAYEY SILT
- SANDY CLAYEY SILT
- SANDY SILT
- CLAYEY SANDY SILT
- SAND
- CLAYEY SAND
- SILTY CLAYEY SAND
- SILTY SAND
- CLAYEY SILTY SAND

PERMEABILITY GROUPS:

LOW — FINE-GRAINED MATERIALS: SILT, CLAY SANDY SILT OR CLAY, GRAVELLY SILT OR CLAY, LEAN AND FAT CLAY, SILTY CLAY, AND CLAYEY SILT

MODERATE — MEDIUM-GRAINED MATERIALS: SILTY OR CLAYEY SAND OR GRAVEL

HIGH — COARSE-GRAINED MATERIALS: POORLY GRADED OR WELL GRADED SAND OR GRAVEL WITH LESS THAN 5% FINES

CONTAMINANTS OF CONCERN (ppbv)

- o-xylenes
- Benzene
- Toluene

▼ APPROXIMATE WATER LEVEL ELEVATION

<< CONCENTRATION IS LESS THAN 1,000 ppbv

>> CONCENTRATION IS GREATER THAN 1,000,000 ppbv

NOTE: CORRELATION OF PERMEABILITY GROUPS IS CONCEPTUAL

SOURCE: Radian, 1995

FIGURE 2.5

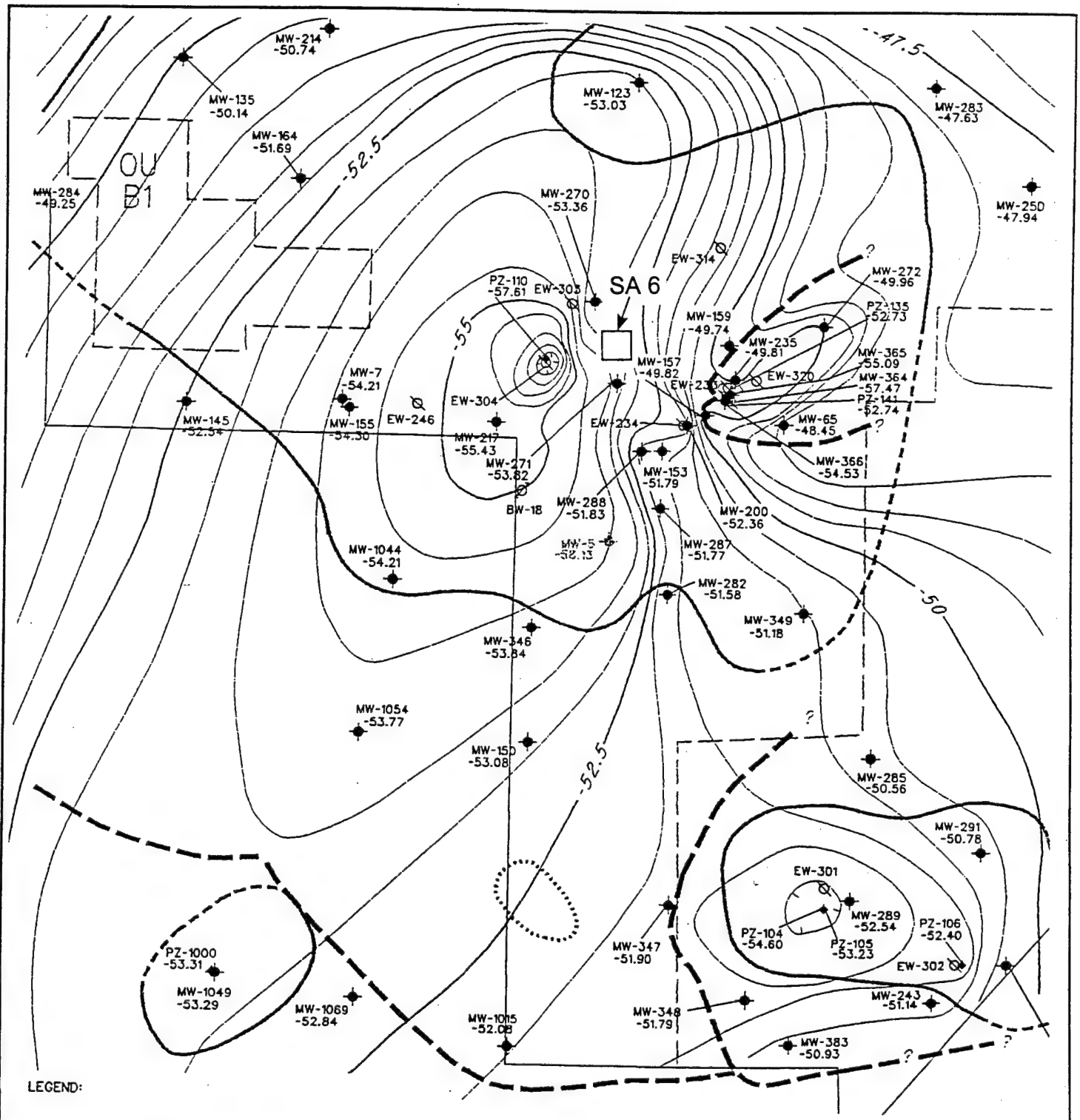
CONCEPTUAL CROSS-SECTION B-B' THROUGH IC 6

McClellan AFB, California

PARSONS ENGINEERING SCIENCE, INC.

Oakland, California

\726876\36\SA6\WORKPLAN\FIGS_L11.CDR 9/30/97



SOURCE: Radian, 1997b

FIGURE 2.6

GROUNDWATER ELEVATIONS AND CAPTURE ZONES NEAR SA 6

McClellan AFB, California

PARSONS ENGINEERING SCIENCE, INC.

Oakland, California

726876\36\SA6\WORKPLAN\FINAL\FIGS_P8.CDR 02/22/98

2.3 PREVIOUS INVESTIGATIONS AND REMEDIATION ACTIVITIES

2.3.1 Remedial Investigations: 1991 to 1993

A near-surface soil vapor survey was performed at SA 6 in 1991 (Radian, 1995). Soil vapor samples were analyzed for total petroleum hydrocarbons (TPH); aromatic volatile organic compounds (VOCs) including benzene, toluene, ethylbenzene, and total xylenes (BTEX); and, halogenated VOCs. The analytical results from that investigation were used to determine soil boring locations during subsequent investigations.

The RI at OU B was conducted from 1991 to 1993 (Radian, 1995). Soil, soil vapor, and Hydropunch® groundwater samples were collected at SA 6 as part of RI activities in OU B. Although chlorinated compounds have been detected in soil and soil vapor at SA 6, the RICS concluded that the source of the chlorinated compounds is within IC 7, located northwest of SA 6. Because only petroleum hydrocarbon contamination is attributed to the former gasoline service station at SA 6, the RICS concluded that the contaminants of potential concern (COPCs) at the SA 6 source area are only TPH and associated BTEX compounds. Therefore, only petroleum-related hydrocarbons are discussed in detail below.

Soil samples were collected from 17 boreholes (IC06B005, IC06B006, IC06B014 through IC06B025, IC06Z8017 [EW279], IC06Z8018 [EW280], and IC06V9007 [PZ91]) from depths between approximately 1 and 103 feet bgs. Sample locations are shown on Figure 2.3. Soil samples were analyzed for TPH, volatile organic compounds (VOCs) including BTEX, halogenated VOCs, and semivolatile organic compounds (SVOCs) Samples were screened for VOCs in the field and selected samples were submitted to an off-site laboratory for analysis. TPH and BTEX compounds detected in soil samples are summarized in Table 2.1. TPH and BTEX were detected in samples from ten boreholes. The maximum TPH and BTEX concentrations were: 3,700 milligrams per kilogram (mg/kg) extractable TPH, 22 mg/kg benzene, 300 mg/kg toluene, and 570 mg/kg total xylenes (all from samples collected from IC06B006 between depths of approximately 16 and 36 feet bgs).

Polycyclic aromatic hydrocarbons (PAHs), primarily naphthalene and 2-methylnaphthalene, were also detected in a limited number of soil samples. The maximum concentrations of naphthalene and 2-methylnaphthalene were 39 mg/kg and 33 mg/kg, respectively (from a sample collected at 15.7 feet bgs from IC06B006). PAH detections correlated with petroleum hydrocarbon detections and were not included as COPCs in the RICS.

Downhole soil vapor samples were also collected from each of the 17 boreholes. Samples were screened for VOCs in the field using a gas chromatograph (GC) equipped with a photoionization detector (PID), and selected samples were submitted to an off-site laboratory for VOC analysis using EPA method TO-14. Soil vapor results for petroleum hydrocarbons are summarized in Table 2.2. The maximum BTEX concentrations were: 1,200 parts per million by volume (ppmv) benzene, 1,500 ppmv toluene, 150 ppmv ethylbenzene, and 630 ppmv total xylenes (all from a sample collected from IC06Z8017 (EW279) at a depth of 20 feet bgs).

Table 2.1
Petroleum Hydrocarbons Detected in Soil Samples
SA 6 - McClellan AFB, California

			TPH		Aromatic VOCs			
		Method:	8015M		8015M/8020/8240 and [Field Screening Methods] [1]			
		Analyte:	TPHV	TPHE	Benzene	Toluene	Ethyl-benzene	Total Xylenes
Boring No. (Completion)	Date	Depth (feet bgs)	all concentrations in mg/kg					
IC06B005	12/10/91	10.3	n.a	ND	[0.0022]	[ND]	[n.a.]	[ND]
		13.2	n.a	n.a.	[0.0025]	[ND]	[n.a.]	[ND]
		15.5	n.a	2,600	[14]	[22]	[n.a.]	[55]
		16.8	n.a	n.a.	[0.035]	[0.073]	[n.a.]	[0.133]
		19.4	n.a	n.a.	[0.03]	[0.028]	[n.a.]	[0.083]
		20.7	n.a	n.a.	[0.015]	[0.0023]	[n.a.]	[0.0159]
		23.3	n.a	ND	[0.0063]	[ND]	[n.a.]	[0.011]
		33.2	n.a	14	[ND]	[ND]	[n.a.]	[ND]
		35.4	n.a	n.a.	[0.0036]	[ND]	[n.a.]	[ND]
		40.7	n.a	n.a.	[ND]	[ND]	[n.a.]	[0.0032]
IC06B006	3/17/92	13.3	n.a	ND	[0.048]	[0.24]	[n.a.]	[2.18]
		15.7	n.a	3,700	[0.044]	[ND]	[n.a.]	[0.0081]
		19.2	n.a	n.a.	[ND]	[1.6]	[n.a.]	[28]
		23.3	n.a	900	[0.026]	[ND]	[n.a.]	[0.056]
		23.3	n.a	n.a.	0.009 [0.053]	0.015 [0.073]	ND [n.a.]	0.030 [0.012]
		28.0	n.a	n.a.	[7.5]	[70]	[n.a.]	[211]
		32.7	n.a	1,500	[19]	[200]	[n.a.]	[350]
		35.4	n.a	n.a.	[22]	[300]	[n.a.]	[570]
		40.9	n.a	n.a.	[0.078]	[0.091]	[n.a.]	[0.036]
		46.9	n.a	ND	[0.0068]	[ND]	[n.a.]	[ND]
		51.9	n.a	n.a.	[0.02]	[0.0099]	[n.a.]	[0.0118]
		61.0	n.a	n.a.	[0.0078]	[ND]	[n.a.]	[0.0036]
		67.0	n.a	n.a.	[0.0034]	[ND]	[n.a.]	[ND]
		76.0	n.a	ND	[ND]	[ND]	[n.a.]	[ND]
		87.0	n.a	n.a.	[0.0027]	[ND]	[n.a.]	[ND]
		90.6	n.a	n.a.	[0.0039]	[ND]	[n.a.]	[0.0043]
		96.0	n.a	n.a.	[0.0052]	[0.0056]	[n.a.]	[0.0081]
		100.2	n.a	ND	[ND]	[0.028]	[n.a.]	[0.021]
IC06B015	2/13/92	15.4	n.a	17	[ND]	[ND]	[n.a.]	[ND]
IC06B018	2/13/92	11.3	n.a	16	[ND]	[ND]	[n.a.]	[ND]
IC06B021	1/14/92	13.4	n.a	20	[ND]	[ND]	[n.a.]	[ND]
IC06B022	1/14/92	8.4	n.a	44	[ND]	[ND]	[n.a.]	[ND]
IC06B023	1/14/92	17.4	n.a	n.a.	[0.0025]	[ND]	[n.a.]	[ND]
IC06B024	1/14/92	102.8	n.a	n.a.	[0.0024]	[ND]	[n.a.]	[ND]
IC06Z8016	2/10/93	29.9	n.a	n.a.	0.013	0.23	ND	0.77
		39.8	n.a	n.a.	0.032	0.013	ND	0.048
		60.0	ND	30	[n.a.]	[n.a.]	[n.a.]	[n.a.]
IC06Z8017 (EW 279)	2/11/93	15.0	0.38	ND	[ND]	[0.01]	[n.a.]	[0.024]
		39.9	0.37	ND	[0.013]	[0.0076]	[n.a.]	[ND]
		50.8	ND	ND	[ND]	[0.0096]	[n.a.]	[0.015]
		80.2	ND	ND	[ND]	[0.0073]	[n.a.]	[ND]
VMP-1	7/19/93	17.5	1,210	n.a.	4.2	18	14	27
	9/28/94		ND	n.a.	0.098	0.11	0.51	1.1

[1] Field screening results reported in brackets. Field screening methods are detailed in Radian, 1995.

n.a. : not analyzed

ND : Not detected at or above the reporting limit

TPHV : Volatile total petroleum hydrocarbons

TPHE : Extractable total petroleum hydrocarbons

Table 2.2
Petroleum Hydrocarbons Detected in Soil Vapor Samples
SA 6 - McClellan AFB, California

		Method:	EPA TO-3	EPA TO-14/EPA TO-3 and [Field Screening Methods] [1]							
		Analyte:	TPH-g	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Cyclo-hexane	Octane	TMBs	1,3-butadiene
Boring No. (Completion)	Date	Depth (feet bgs)	all concentrations in ppmv								
IC06B0025	2/16/93	20	n.a.	0.0012 [ND]	0.0046 [0.027]	0.0027 [n.a.]	0.0111 [0.124]	0.0014 [n.a.]	0.009 [n.a.]	0.026 [n.a.]	ND [n.a.]
		40	n.a.	[ND]	[ND]	[n.a.]	[0.23]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
IC06B005	12/10/91	21	n.a.	27 [21]	ND [ND]	15 [n.a.]	90 [46]	14 [n.a.]	7.8 [n.a.]	90 [n.a.]	ND [n.a.]
		42	n.a.	[0.81]	[0.37]	[n.a.]	[0.54]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
IC06B006	3/17/92	21	n.a.	[200]	[190]	[n.a.]	[294]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
		41	n.a.	[680]	[890]	[n.a.]	[168]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
		61	n.a.	[10]	[3.4]	[n.a.]	[2.03]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
		96	n.a.	[4]	[18]	[n.a.]	[26.3]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
IC06B021	1/14/92	21	n.a.	[ND]	[ND]	[n.a.]	[0.073]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
IC06B022	1/14/92	21	n.a.	ND	ND	ND	ND	ND	ND	ND	1.6
IC06B024	3/23/92	61	n.a.	[ND]	[0.029]	[n.a.]	[0.041]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
		96	n.a.	[0.01]	[ND]	[n.a.]	[ND]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
IC06V9007 (PZ 91)	2/8/93	20	n.a.	ND [0.35]	ND [0.42]	ND [n.a.]	ND [0.59]	ND [n.a.]	2.0 [n.a.]	0.16 [n.a.]	ND [n.a.]
		40	n.a.	6.0 [0.78]	0.36 [0.35]	3.2 [n.a.]	2.9 [2.7]	12 [n.a.]	5.1 [n.a.]	7.7 [n.a.]	ND [n.a.]
		80	n.a.	[0.84]	[0.092]	[n.a.]	[0.362]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
		100	n.a.	[0.86]	[ND]	[n.a.]	[ND]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
	7/7/93	23 to 25	13,000	38	35	6.6	22	n.a.	n.a.	n.a.	n.a.
	9/19/94		68	0.11	0.33	0.20	2.0	n.a.	n.a.	n.a.	n.a.
IC06Z8016	2/9/93	42	n.a.	[0.094]	[ND]	[n.a.]	[ND]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
		60	n.a.	[ND]	[0.011]	[n.a.]	[ND]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
		80	n.a.	0.0083 [ND]	0.014 [ND]	0.0024 [n.a.]	0.0093 [ND]	0.13 [n.a.]	0.099 [n.a.]	0.0012 [n.a.]	ND [n.a.]
IC06Z8017 (EW 279)	2/11/93	20	n.a.	630 [1,200]	1,400 [1,500]	150 [n.a.]	520 [630]	3,200 [n.a.]	580 [n.a.]	185 [n.a.]	ND [n.a.]
		40	n.a.	[640]	[450]	[n.a.]	[320]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
		50	n.a.	98 [310]	610 [1,100]	110 [n.a.]	520 [540]	840 [n.a.]	ND [n.a.]	41 [n.a.]	ND [n.a.]
		60	n.a.	[21]	[15]	[n.a.]	[24.4]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
		80	n.a.	43 [210]	190 [560]	43 [n.a.]	230 [320]	450 [n.a.]	180 [n.a.]	89 [n.a.]	ND [n.a.]
	8/30/93	25 to 100	14,000	130	140	9.4	130	n.a.	n.a.	n.a.	n.a.
	9/19/94		220	0.21	1.6	1.0	11	n.a.	n.a.	n.a.	n.a.
IC06Z8018 (EW 280)	2/12/93	20	n.a.	38 [330]	330 [630]	33 [n.a.]	110 [220]	960 [n.a.]	200 [n.a.]	26 [n.a.]	ND [n.a.]
		40	n.a.	[9]	[2.9]	[n.a.]	[5.2]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
		50	n.a.	[4.6]	[5]	[n.a.]	[8.5]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
		60	n.a.	[0.57]	[0.22]	[n.a.]	[ND]	[n.a.]	[n.a.]	[n.a.]	[n.a.]
		82	n.a.	0.66 [12]	1.2 [3.5]	0.55 [n.a.]	2.5 [4.8]	110 [n.a.]	9.5 [n.a.]	8.4 [n.a.]	ND [n.a.]
		100	n.a.	0.61 [53]	ND [8.5]	ND [n.a.]	ND [3.0]	150 [n.a.]	7.9 [n.a.]	ND [n.a.]	ND [n.a.]
	7/7/93	15 to 100	55	ND	0.13	0.051	0.35	n.a.	n.a.	n.a.	n.a.
	9/19/94		6.0	ND	0.03	0.022	0.096	n.a.	n.a.	n.a.	n.a.
VMP-1	7/7/93	17	130,000	490	320	34	170	n.a.	n.a.	n.a.	n.a.
	9/19/94		3,300	15	27.0	18	130	n.a.	n.a.	n.a.	n.a.

[1] Field screening results reported in brackets. Field screening methods are detailed in Radian, 1995.

n.a. : not analyzed

ND : Not detected at or above the reporting limit

TPH-g : Total petroleum hydrocarbons as gasoline

TMBs : Trimethylbenzenes

ppmv : parts per million by volume

Hydropunch® groundwater samples were collected from IC06B006 and IC06B024 during the RI (Table 2.3). The two samples were analyzed for both aromatic VOCs and halogenated VOCs. BTEX concentrations in the sample collected from IC06B006 were: 310 micrograms per liter (µg/L) benzene, 650 µg/L toluene, 130 µg/L ethylbenzene, and 740 µg/L total xylenes. No BTEX compounds were detected from the sample collected from IC06B024. Halogenated VOCs were detected in both Hydropunch® samples. The maximum concentrations were: 180 µg/L trichloroethene (TCE), 240 µg/L 1,2-dichloroethane Table 2.3 Groundwater

(1,2-DCA), 41 µg/L 1,2-dichlorobenzene (1,2-DCB), 9.0 µg/L 1,2-dichloropropane (1,2-DCP), and 11 µg/L chloroform. Recent groundwater monitoring results for monitoring well MW-271, located downgradient of the SA 6 source area, are also shown in Table 2.3. No BTEX compounds were detected. TCE was detected at a concentration of 16.9 µg/L and several other halogenated VOCs were detected at concentrations less than 1 µg/L.

2.3.2 Bioventing Pilot Test: 1993-1994

As part of the USAF Bioventing Initiative Project, Parsons ES completed installation of a bioventing system at SA 6 in July 1993 to treat petroleum-hydrocarbon contaminated vadose zone soils (ES, 1994). Procedures used to conduct bioventing testing and operations followed the USAF bioventing protocol documents (Hinchee et al., 1992; Downey and Hall, 1994) and the USEPA bioventing manual (USEPA ORD, 1995).

The two existing VWs (EW279 and EW280) were utilized for air injection. Two additional VMPs (VMP-1 and VMP-2) were installed to supplement the existing VMP (PZ91) to monitor system performance. VW and VMP locations are shown on Figure 2.3.

During installation of the additional VMPs and prior to operation of the bioventing system, baseline soil and soil vapor samples were collected and analyzed for TPH and BTEX. Soil and soil vapor sample results are shown in Tables 2.1 and 2.2, respectively. During this baseline sampling, one soil sample was collected from VMP-1 at a depth of 17.5 feet bgs. TPH and BTEX were detected in this soil sample at concentrations of 1,210 mg/kg TPH as gasoline (TPH-g), 4.2 mg/kg benzene, 18 mg/kg toluene, 14 mg/kg ethylbenzene, and 27 mg/kg total xylenes.

The two VWs used for air injection, EW279 and EW280, were screened between 25 to 100 feet bgs and 15 to 100 feet bgs, respectively. Three casing strings/screens were installed in both VMP-1 and VMP-2 and 6 casing strings/screens were installed in PZ91 to provide monitoring points at variable depths, soil types, and contaminant concentrations. The center of the screened intervals for each VMP were: 17, 30, and 54 feet bgs (VMP-1); 19.5, 30, and 49 feet bgs (VMP-2); and, 24, 37, 49, 57, 75, and 99 feet bgs (PZ91).

Bioventing pilot testing included performing an *in situ* respiration (ISR) test to estimate biodegradation rates and an air permeability (AP) test to determine the area treated by the system and to collect data for comparison to other Bioventing Initiative sites. Initial ISR tests were conducted in July and September 1993. The first initial ISR test was conducted at PZ91 and the second initial ISR test was conducted at the VWs and VMP-1 and VMP-2. Based on

Table 2.3
Volatile Organic Compounds Detected in Groundwater
SA 6 - McClellan AFB, California

		Aromatic VOCs				Halogenated VOCs							
	Method:	EPA 8020				EPA 8010							
	Analyte:	Benzene	Toluene	Ethyl-benzene	Total Xylenes	CT	Chloro-form	1,2-DCB	1,2-DCA	cis-1,2-DCE	1,2-DCP	PCE	TCE
Location	Date	all results in µg/L											
IC06B006[1]	3/18/92	310	650	130	740	ND	11	41	240	ND	9.0	ND	180
IC06B024[1]	3/24/92	ND	ND	ND	ND	ND	ND	ND	32	ND	ND	ND	170
MW-271	10/13/95	ND (ND)	ND (ND)	ND (ND)	ND (ND)	0.157 (0.159)	0.877 (0.654)	ND (ND)	0.829 (0.804)	0.137 (0.107)	0.0707 (0.0744)	0.186 (0.146)	16.9 (16.5)

[1] Hydropunch sample
ND : Not detected at or above the reporting limit
(0.146) : Duplicate analyses shown in parentheses

CT : Carbon Tetrachloride
DCB : Dichlorobenzene
DCA : Dichloroethane
DCE : Dichloroethene

DCP : Dichloropropane
PCE : Tetrachloroethene
TCE : Trichloroethene

the results of the July and September 1993 ISR tests, biodegradation rates ranged from an estimated 40 mg TPH per kg of soil per year to 2,500 mg TPH per kg of soil per year (ES, 1994).

The AP test was conducted in August 1993. During the AP test, air was injected into EW279 at a flow rate of approximately 38 standard cubic feet per minute (scfm). Test results indicated that the radius of oxygen and pressure influence exceeded 30 feet and the air permeability of site soils ranged from 7.3 to 24 darcys. Extended air injection operations began in September of 1993. Air was injected into both EW279 and EW280 at flow rates of approximately 50 scfm and 60 scfm, respectively.

Based on pressure response measured during extended system operations, the effective treatment radius from injecting air into both VWs exceeds 100 feet (Figure 2.3). Some of the less permeable zones within this estimated 100-foot treatment radius may not be as effectively aerated as the more permeable zones. However, oxygen diffusion from the more permeable zones into the less permeable zones could be expected, especially given the heterogeneous nature of soils at the site (Section 2.2.2). In addition, the presence of relatively thick, permeable sand lenses between the low permeability zones and groundwater could be expected to provide aerobic zones where any downward-migrating contaminants could be biodegraded before they reached groundwater.

Follow-up ISR tests were conducted in March and September 1994, after approximately 6 months and one year of air injection operations, respectively. After one year of operation, biodegradation rates ranged from 0 to 600 mg TPH per kg of soil per year (AFCEE, 1995). These rates were approximately one order of magnitude lower than those measured initially, indicating that while biodegradable contaminants still remained in the soil, the more soluble and easiest to degrade contaminants had probably already been degraded. Soil and soil vapor samples collected after one year of operation in September 1994 confirmed that contaminant concentrations were reduced by at least one order of magnitude and that concentrations of the more soluble, easier to degrade BTEX components were significantly reduced (Tables 2.1 and 2.2).

2.4 SUMMARY OF SITE CONTAMINANTS

The COPCs at the SA 6 source area are TPH, benzene, and toluene, which have been detected in both soil and soil vapor and appear to have impacted groundwater beneath the site (Radian, 1995). Based on the sampling conducted during the RI and during bioventing system installation (Tables 2.1 and 2.2; Figure 2.3), the maximum concentrations of petroleum-hydrocarbon residuals in soil were located in the area of the former USTs, east and northeast of the former service station building. Soil and soil vapor contaminant concentrations were highest between 15 and 35 feet bgs and significantly attenuated with depth. Soil contaminant concentrations did not exceed 30 mg/kg TPH or 0.3 mg/kg total BTEX below 35 feet bgs at any location. Soil vapor contaminant concentrations were also highest between 15 and 35 feet bgs and attenuated with depth; however, downhole soil vapor concentrations exceeded 1,100 ppmv and 64 ppmv total BTEX in the deepest samples collected from EW279 and EW280, respectively.

Based on oxygen and pressure measurements taken during the initial bioventing pilot test in 1993 and after extended bioventing system operations in 1994, all of the contaminated soils at the site are within the influence of the existing bioventing system (Figure 2.3). Significant reductions in soil and soil vapor concentrations after one year of operation indicated that the bioventing system was successful in degrading fuel residuals (Section 2.3.2). However, based on the measured respiration rates, calculated biodegradation rates, and soil and soil vapor contaminant concentrations measured in 1994, the recommendation was made to continue bioventing system operation to further reduce residual soil fuel hydrocarbon contamination (AFCEE, 1995). It is expected that fuel residuals have been further reduced since September of 1994 and that contaminant concentrations in both soil and soil vapor are now at concentrations that support a recommendation for NFI status. A specific sampling and analysis plan to support a NFI recommendation is provided in Section 3.

SECTION 3

SAMPLING AND ANALYSIS PLAN

The following SAP describes the sampling locations, sampling procedures, and analytical methods proposed to collect sufficient information to support a recommendation of NFI at SA 6. Drilling operations, soil and soil vapor sample collection procedures, equipment decontamination procedures, and disposal of investigation-derived waste (IDW) will follow the McClellan AFB Basewide RI/FS Quality Assurance Project Plan (QAPP) (Radian, 1997a). A QAPP Applicability Checklist and Applicability Statement appears in Appendix A.

3.1 SAMPLING LOCATIONS

Prior to collection of soil samples, soil vapor samples will be collected from all VMPs at SA 6. Soil vapor samples will be collected from all depths at the existing VMPs, which are listed below:

- VMP-1: 17, 30, and 50 feet bgs;
- VMP-2: 19.5, 30, and 49 feet bgs; and,
- PZ-91: 24, 37, 49, 57, 75, and 99 feet bgs.

A total of twelve (12) soil vapor samples plus one (1) duplicate will be collected.

The bioventing system blower will be turned off at least one month prior to soil and soil vapor sample collection to allow the soil vapor to reach equilibrium. Soil vapor samples will be analyzed in the field for oxygen, carbon dioxide, TVH, and ionizable compound concentrations using field instruments. A total volatile hydrocarbon analyzer (TVHA) calibrated against hexane will be used to measure TVH concentrations and a photoionization detector (PID) will be used to measure ionizable compound concentrations. Soil vapor samples from each location will also be collected in Summa™ canisters for laboratory analysis of TVH and BTEX. Soil vapor samples will be collected and analyzed as described in Section 3.2 and Section 3.3, respectively.

The soil vapor sample results will be used to determine if soil sampling is appropriate and will be used to guide the depths selected for any subsequent soil sampling. The soil vapor sample results may also indicate that the bioventing system should continue to be operated. In this case, soil sampling would be delayed until future soil vapor sampling results indicate that significant contamination no longer remains in the vadose zone soils. Parsons ES will provide a short Letter Report which will detail the soil vapor sample results. This Letter Report will also make recommendations on depths for subsequent soil sampling or will recommend continued system operation. Drilling and soil sample collection will proceed

only after receipt and review of this Letter Report by McClellan AFB, AFCEE, and the regulatory agencies.

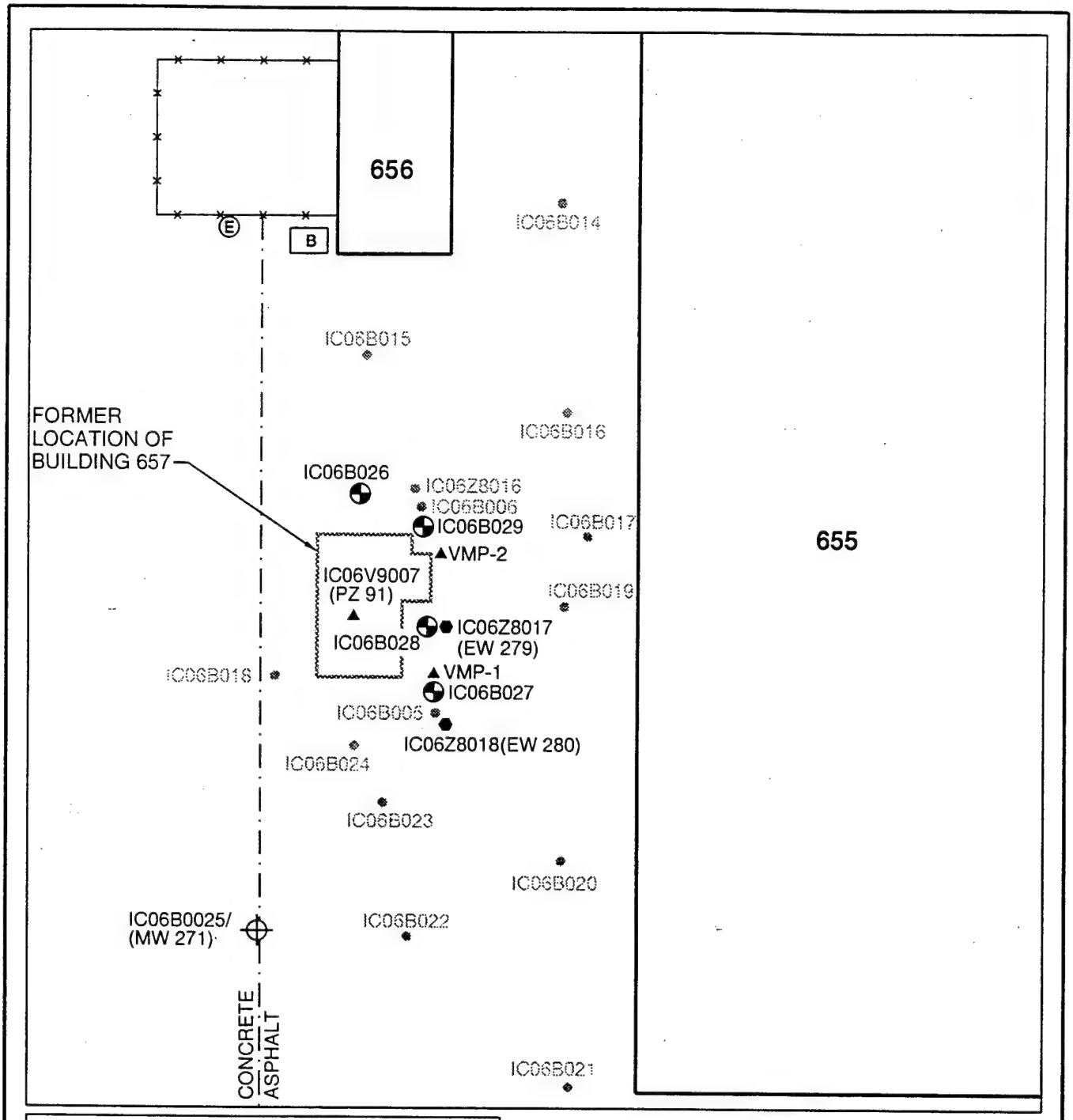
In addition to contaminant concentrations in soil vapor, equilibrium oxygen concentrations will also be used to guide selection of soil sample depths. Aerobic biodegradation of petroleum hydrocarbons is considered limited only when oxygen concentrations are less than 5% (Hinchee *et al.*, 1992; USEPA ORD, 1995). Experience from the USAF Bioventing Initiative indicates that after extended operations, equilibrium oxygen concentrations greater than 10% results in very low to insignificant respiration rates. Under these conditions, natural air diffusion alone would provide sufficient oxygen to meet any long-term oxygen demands.

When soil sampling is conducted, samples will be collected from four borings located in the vicinity of the former USTs (Figure 3.1). The four borings will be designated IC06B026, IC06B027, IC06B028, and IC06B029, following the naming convention established during the RI. Because previous soil and soil vapor sampling results (Tables 2.1 and 2.2) indicated that contaminant concentrations were highest at or above approximately 40 feet bgs, each of the four borings will be drilled at least to a depth 40 feet bgs.

If field observations (i.e., soil headspace screening and/or visual or physical evidence) or previous soil vapor sample results indicate that the depth of contamination extends beyond 40 feet bgs, the boring will be extended until field observations indicate that the vertical extent of contamination has been identified. Multiple field observations across changes in lithology, which are typically encountered at least every 10 feet at SA 6 (Figures 2.4 and 2.5), will be used to determine vertical extent. Proposed sampling depths may also be altered in the field based on field observations and site lithology.

The locations for three of the four borings (IC06B027, IC06B028, IC06B029) have been chosen in areas where the maximum concentrations of TPH and BTEX were detected in soil and soil vapor samples during prior investigations (i.e., adjacent to IC06B006, IC06B005/VMP-1, and EW279) (Tables 2.1 and 2.2). The fourth boring (IC06B026) has been located north of PZ-91 where the northern extent of the former excavation was terminated due to a utility line. All four borings are within the estimated radius of influence of the bioventing system and near or within areas with previously detected BTEX or TPH in soil, soil vapor, and/or groundwater. The purpose of these additional borings will be to determine if petroleum hydrocarbon residuals in soil have been reduced sufficiently to allow a recommendation of NFI at SA 6 and to evaluate the effectiveness of the bioventing system.

It is anticipated that at least three soil samples will be collected from each of the four borings for laboratory analyses in addition to one duplicate sample (approximately 13 total samples). As discussed above, a final determination of the number of samples and sample depths will be made after review of the soil vapor sample results. The first sample collected from each boring will be at a depth of at least 20 feet bgs, the approximate depth of the former USTs. Because the three existing VMPs are located near the proposed soil borings (Figure 3.1), soil vapor samples from the existing VMPs will be collected in lieu of downhole soil vapor samples during drilling operations. Soil samples will be collected and analyzed as described in Section 3.2 and Section 3.3, respectively.



EXPLANATION

656	BUILDING
— · — · —	CONCRETE/ASPHALT BORDER
IC06B026	PROPOSED SOIL BORING
IC06B022	PREVIOUS SOIL BORING
EW 279	EXISTING VENT WELL
VMP-1	EXISTING VAPOR MONITORING POINT (PIEZOMETER)
MW-271	GROUNDWATER MONITORING WELL
×—×—×	FENCE

N

0 25 50

SCALE IN FEET

FIGURE 3.1
SAMPLING LOCATIONS
PROPOSED SAMPLING LOCATIONS
SA 6
McCLELLAN AFB, CALIFORNIA

PARSONS ENGINEERING SCIENCE, INC.

Oakland, California

REV. 5 MCCL-004.DWG 02/23/98

Because BTEX compounds have previously been detected in groundwater at the site (Table 2.3), at least one boring will be drilled to groundwater, which is located at approximately 105 feet bgs. Since BTEX compounds were previously detected from a Hydropunch® groundwater sample collected from IC06B006, proposed soil boring IC06B029 (located adjacent to IC06B006) will be drilled to groundwater if neither of the previous three borings are drilled to groundwater. A Hydropunch® groundwater sample will be collected from any boring drilled to groundwater and analyzed for BTEX compounds.

3.2 SOIL AND SOIL VAPOR SAMPLE COLLECTION

Boreholes will be advanced using a drill rig equipped with 8-inch outside-diameter (OD) hollow-stem auger. Continuous coring of the borings will be conducted below 20 feet bgs in order to best select the intervals for sampling. Soil samples will be collected in a 2-inch inside-diameter (ID) split-barrel sampler. The sampler will be lowered through the hollow stem of the augers and driven approximately one to two feet into undisturbed soil ahead of the augers. The split-barrel sampler will be fitted with three pre-cleaned, 6-inch long, thin-walled, brass sleeves. After collection of a sample, the sampler will be retrieved, split apart, and the sleeves will be removed. The ends of the sleeves will be immediately capped with Teflon® tape and plastic endcaps. Samples will be labeled with the site name, borehole number, sample depth, and date and time of collection. The sleeves will be placed in an insulated shipping container with ice and will be maintained in a chilled condition.

A portion of soil from each split spoon will be used for soil headspace screening. Each headspace screening sample will be placed in a sealed plastic bag and allowed to sit in the shade for at least 5 minutes. Soil headspace will then be screened using a total volatile hydrocarbon analyzer (TVHA) and photoionization detector (PID). The soil headspace reading will be used in combination with physical and visual evidence of contamination (e.g. odors, staining) to select samples for laboratory analysis. Soil samples selected for laboratory analysis will be shipped to Quanterra Incorporated Laboratories in Denver, Colorado, which has been audited by the U.S. Air Force and meets all quality assurance/quality control (QA/QC) and certification requirements for the State of California. A chain-of-custody form will accompany all samples.

Boreholes will be logged by a Parsons ES geologist. The geologist will be responsible for observing all field investigation activities, maintaining a detailed descriptive log of all subsurface materials recovered during soil coring, and properly labeling and storing samples.

Soil vapor samples will be collected by purging the individual casing string/screen of stagnant air using a small, 1-scfm air pump at the ground surface. The vacuum and flow will be properly monitored and adjusted to prevent leakage of ambient air into the sampling system. After purging, the air pump will be connected to a vacuum chamber at the ground surface holding a 3-liter Tedlar® sample bag. The chamber will then be evacuated with the air pump, filling the bag with the soil vapor sample. Soil vapor samples will be analyzed in the field with an oxygen/carbon dioxide meter, a TVHA, and a PID. Soil vapor samples will also be collected in Summa™ canisters by directly connecting the canister to the casing string. A leak and vacuum check will be performed prior to sampling collection in order to

ensure that ambient air does not leak into the sampling system and that the canister has not leaked prior to its use.

Soil vapor samples will be labeled with the site name, borehole number, sample depth, and date and time of collection. The Summa™ canisters will not be chilled to prevent condensation of hydrocarbons. Soil vapor samples will be shipped to Air Toxics, Ltd. of Folsom, California which meets all QA/QC and certification requirements for the State of California. A chain-of-custody form will accompany all samples.

After sampling is complete, each sampling location will be restored as closely to its original condition as possible. Boreholes will be sealed with bentonite chips, pellets, or grout to eliminate any creation or enhancement of contaminant migration pathways to the groundwater. Asphalt patch will be used to finish surface completion as close to the parking lot grade as practicable.

3.3 SAMPLE ANALYSES

Soil samples will be analyzed by modified Method SW8015 for purgeable TPH (gasoline range organics [GRO]) and extractable TPH (diesel range organics [DRO]), by EPA Method 8020A for BTEX compounds, and by ASTM D-2216 for soil moisture. Soil samples containing total TPH will also be analyzed for soluble TPH using the waste extraction test (WET) preparation method described in California Administrative Code (CAC) Title 22, article 11, section 66700 (C through F) except that the extraction solution for the WET test shall consist of deionized water. Soil vapor samples will be analyzed for TPH quantitated as gasoline (TPH-g) and BTEX by EPA Method TO-3. Groundwater samples will be analyzed by EPA Method 8020A for BTEX compounds.

3.4 DISPOSAL OF INVESTIGATION DERIVED WASTE

In compliance with McClellan AFB procedures, all drill cuttings and decontamination fluids will be containerized on site in labeled U.S. DOT-approved 55-gallon drums provided by the Base. The containerized wastes will be transported to an appropriate Base disposal facility by Base personnel.

SECTION 4

CRITERIA TO BE USED FOR NO FURTHER INVESTIGATION RECOMMENDATION

No specific site cleanup standards apply to petroleum-contaminated soils at McClellan AFB. The recommendation for NFI or for further operation of the bioventing system will be made based on evaluating the proposed sampling and analysis results in accordance with principles set forth in the Designated Level Methodology (DLM) (Marshack, 1992) and the California Leaking Underground Fuel Tank (LUFT) Guidelines (California SWRCB, 1989). The DLM and LUFT Guidelines can be used to evaluate the potential impact of any remaining residual soil contamination to groundwater.

The potential impact to groundwater will also be evaluated based on the potential leachability of any contaminants as determined by the de-ionized water waste extraction test (DI-WET) preparation method for TPH, as described in Section 3. The results of the DI-WET will allow for a comparison of total TPH to soluble TPH, which is expected to have been preferentially degraded. Groundwater impacts will also be evaluated by comparing soil contaminant concentrations to soil vapor contaminant concentrations and by measuring soil vapor oxygen concentrations to determine if soils are sufficiently aerobic to support unassisted biodegradation (i.e., without air injection).

Depending on the results of soil and soil vapor sampling, it may be necessary to perform more sophisticated vadose zone modeling (e.g., using the SESOIL or VLEACH models) to determine the potential threat to groundwater quality or to demonstrate that any remaining soil residuals will not impact groundwater. Although input data necessary for such modeling will either be collected during the sampling and analysis described in Section 3 (e.g., contaminant concentrations, soil moisture), have been collected previously at the site (e.g., soil lithology, depth to groundwater), or have already been established for McClellan AFB soils (e.g., total organic carbon content), vadose zone modeling is currently beyond the scope of this work.

SECTION 5

REPORT FORMAT

Following sampling activities and receipt of the laboratory analytical results, a short Letter Report will be prepared and submitted to AFCEE and McClellan AFB, who will then submit the report to the local regulatory agencies.

The report will contain the following information:

- Site map showing sampling locations;
- Summary of field activities, procedures, and field screening and laboratory analytical results;
- Certified analytical laboratory reports and chain-of-custody forms;
- Borehole logs; and,
- Conclusions and recommendations for either NFI or continued operation of the bioventing system.

SECTION 6

PROJECT SCHEDULE

The following schedule is based on anticipated time requirements for regulatory reviews and approvals and assumes that this final SAP will be submitted in its current form to the regulatory agencies.

DESCRIPTION	COMPLETION DATE
Draft SAP delivered to McClellan AFB and AFCEE	10 October 1997
All comments to Draft SAP received from McClellan AFB, AFCEE, and regulatory agencies	03 December 1997
Blower shut down	03 December 1997
Final SAP delivered to McClellan AFB and AFCEE	23 February 1998
McClellan AFB Field Manager notified of proposed field activities	23 February 1998
Soil vapor sampling activities	09 March 1998
Soil boring locations marked by Parsons ES	09 March 1998
Letter Report with soil vapor results delivered to McClellan AFB and AFCEE	13 April 1998
Concurrence to proceed with soil sampling due from McClellan AFB, AFCEE, and regulatory agencies	01 May 1998
Digging permit due from McClellan AFB	01 May 1998
Drilling and soil sampling activities	08 May 1998
Draft Report delivered to McClellan AFB and AFCEE	31 July 1998
Comments to Draft Report due from McClellan AFB, AFCEE, and regulatory agencies	28 August 1998
Final Report delivered to McClellan AFB and AFCEE	11 September 1998

SECTION 7

REFERENCES

AFCEE 1995, Memorandum from AFCEE to Mr. Mario Ierardi (SM-ALC/EMR) dated 13 April 1995, Subject: Completion of One Year Bioventing Tests: Tank Farm #2; Tank Farm #4; SA-6; PRL-T-46; Davis Global Communications

California State Water Resources Control Board (CSWRCB), 1989, *Leaking Underground Fuel Tank Field Manual: Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure*. October

California Regional Water Quality Control Board (CRWQCB), Central Valley Region, 1990, *Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites*. Prepared by the Staff of North Coast RWQCB, San Francisco Bay RWQCB, and Central Valley RWQCB. August

California Regional Water Quality Control Board (CRWQCB) 1997, Letter from Alexander MacDonald to Ms. Elaine Anderson (SM-ALC/EMR), dated 14 February 1997, *Recommendation For No Further Investigation at Tank Farm #4 (PRL T-18), McClellan AFB (Tanks T 4-1 through T 4-4).*

Downey, D.C., and Hall, J. F., 1994. *Addendum One to Test Plan and Technical Protocol for a Field Treatability Test for Bioventing - Using Soil Gas Surveys to Determine Bioventing Feasibility and Natural Attenuation Potential.* Prepared for the Air Force Center for Environmental Excellence, Brooks Air Force Base, San Antonio, Texas.

Engineering-Science, Inc. (now Parsons ES) 1994, *Part I: Bioventing Pilot Test Work Plan for Tank Farm #2, Tank Farm #4, SA 6, PRL T-46, Building 720, McClellan AFB, California and Davis Global Communications Site, Davis, California and Part II: Draft Bioventing Pilot Test Interim Results Report for Tank Farm #2, Tank Farm #4, SA 6, PRL T-46, Building 720, McClellan AFB, California and Davis Global Communications Site, Davis, California.* Prepared for AFCEE and McClellan AFB. February

Hinchee et al. 1992, *Test Plan and Technical Protocol for a Field Treatability Test for Bioventing*, U.S. Air Force Center for Environmental Excellence (AFCEE), Brooks AFB, Texas. January

Jacobs Engineering Group 1995, *Operable Unit A Interim Basewide Remedial Investigation Draft Final, Part 2A - Site Characterization Summary/Field Sampling Plan.* Prepared for McClellan AFB and AFCEE. August

Marshack, John 1992, *California's Water Quality Standards and Their Applicability to Waste Management and Site Cleanup*. California Water Quality Standards Bulletin. August

Parsons Engineering Science, Inc. (Parsons ES) 1996, *Bioventing Pilot Test Results Report for Capehart Gas Station, McClellan AFB, California*. March

Parsons ES 1997, *Recommendation for No Further Investigation at Tank Farm #4 (PRL T-18), McClellan AFB, California*. February

Radian Corporation 1992, *Installation Restoration Program Stage 7, Preliminary Groundwater Operable Unit Remedial Investigation*. September

Radian Corporation 1995, *McClellan AFB Interim Basewide Remedial Investigation Report, Phase 2B: RI Characterization Summary for IC 6 (Final, Revision 0)*. November

Radian Corporation 1996, *Installation Restoration Program (IRP) Stage 3, Groundwater Sampling and Analysis Program, October through December 1995*. January

Radian International LLC 1997a, *Installation Restoration Program, Stage 3, Quality Assurance Project Plan, Revision 3 (Final)*. Prepared for McClellan AFB Environmental Management. April

Radian International LLC 1997b, *Installation Restoration Program (IRP), Groundwater Monitoring Program (GWMP), Quarterly Report, Third Quarter 1997 (3Q97)* Prepared for McClellan AFB Environmental Management.

USEPA Office of Research and Development (ORD), 1995. *Principles and Practices of Bioventing*, EPA/540/R-95/534, September.

APPENDIX A

QAPP APPLICABILITY CHECKLIST AND APPLICABILITY STATEMENT

APPLICABILITY CHECKLIST

		Applicable	NA
1.0	INTRODUCTION	☒	☐
1.1	QAPP Objectives and Use	☒	☐
1.2	Administrative Procedures	☒	☐
2.0	SITE DESCRIPTION AND HISTORY	☒	☐
2.1	Site History	☒	☐
2.2	Types of Contaminants Reported	☒	☐
3.0	PROGRAM ORGANIZATION AND RESPONSIBILITIES	☒	☐
3.1	Air Force, U.S. EPA, and Cal/EPA	☒	☐
3.2	Supplier Project Organization	☒	☐
4.0	DATA QUALITY OBJECTIVES AND QUALITY ASSURANCE OBJECTIVES	☒	☐
4.1	DQOs and Data Use Planning	☒	☐
4.2	Quality Assurance Objectives	☒	☐
4.3	Geologic Data Quality Assurance Objectives	☒	☐
4.4	Hydrologic Data Quality Assurance Objectives	☒	☐
5.0	FIELD PROCEDURES	☒	☐
5.1	Site Selection	☒	☐
5.2	General Field and Sampling Requirements	☒	☐
5.3	Geophysical Procedures	☐	☒
5.4	Drilling	☒	☐
5.5	Well Installation	☐	☒
5.6	Aquifer and Air Permeability Test Methods	☐	☒
5.7	Cone Penetrometer Procedures	☐	☒
5.8	Groundwater Sampling	☐	☒
5.9	Surface Water Sampling	☐	☒
5.10	Sediment Sampling	☐	☒
5.11	Soil Sampling	☒	☐
5.12	Soil Gas Sampling	☒	☐
5.13	Emission Flux Measurements	☐	☒
5.14	Trenching	☐	☒

6.0	SAMPLE CUSTODY		☒	☐
	6.1	Documentation and Custody Procedures	☒	☐
	6.2	Chain-of-Custody Forms and Master Log	☒	☐
	6.3	Sample Shipment and Handling	☒	☐
	6.4	Laboratory Custody Procedures	☒	☐
7.0	FIELD INSTRUMENT CALIBRATION PROCEDURES		☒	☐
	7.1	Water Sampling Instrument Calibration	☐	☒
	7.2	Real-Time Organic Vapor Monitoring Instrument Calibration	☒	☐
	7.3	Radiation Meter Calibration	☐	☒
	7.4	Canister Flow Controller Calibration	☐	☒
	7.5	Flowmeter Calibration	☐	☒
8.0	ANALYTICAL PROCEDURES AND CALIBRATION		☒	☐
	8.1	Detection and Quantitation Limits	☒	☐
	8.2	Laboratory Standards and Reagents	☒	☐
	8.3	Sample Preparation Procedures	☒	☐
	8.4	Inorganic and Radiochemical Analytical Methods	☐	☒
	8.5	Organic Analytical Methods	☒	☐
	8.6	Air/Soil Gas Analytical Methods	☒	☐
	8.7	Field Methods	☒	☐
9.0	DATA REDUCTION, VALIDATION, AND REPORTING		☒	☐
	9.1	Laboratory Data Reduction and Verification	☒	☐
	9.2	Project Data Flow, Transfer, and Verification	☒	☐
	9.3	Project Data Review and Validation	☒	☐
	9.4	Reporting	☒	☐
10.0	INTERNAL QUALITY CONTROL		☒	☐
	10.1	Off-Site Analytical Laboratory QC Samples	☒	☐
	10.2	On-Site Analytical laboratory QC Samples	☐	☒
	10.3	Field QC Samples	☒	☐
11.0	AUDITS AND DATA VALIDATION		☐	☒
	11.1	Technical Systems Audits	☐	☐
	11.2	Performance Audits	☐	☐
	11.3	Data Validation	☐	☐
	11.4	Recommended Audit Frequency	☐	☐

12.0	PREVENTIVE MAINTENANCE	☒	☐
13.0	DATA ASSESSMENT PROCEDURES	☒	☐
13.1	Blank Data Assessment	☒	☐
13.2	Accuracy	☒	☐
13.3	Precision	☒	☐
13.4	Completeness	☒	☐
13.5	Interlaboratory Data Comparison	☐	☒
13.6	Field and Off-Site Laboratory Data Comparison	☐	☒
14.0	CORRECTIVE ACTION	☒	☐
15.0	QUALITY ASSURANCE REPORTS	☒	☐
16.0	SITE MANAGEMENT	☒	☐

STANDARD OPERATING PROCEDURES

McAFB-001	SOP Format and Content	☒	☐
McAFB-042	General Field Operations	☒	☐
McAFB-002	Conducting Magnetic and Electromagnetic Surveys (Surface)	☐	☒
McAFB-003	Downhole Geophysical Surveys	☐	☒
McAFB-004	Drilling Operations, Well Installation, Well Completion, Well Development, and Borehole Abandonment Procedures	☒	☐
McAFB-041	Well Maintenance Procedures	☐	☒
McAFB-005	Cone Penetrometer Testing	☐	☒
McAFB-006	Installation of Soil Vapor Extraction Wells and Piezometer Nests	☐	☒
McAFB-007	Sampling of Perched Water and Installation of Conductor Casing HSA Borings in Perched Water Conditions	☐	☒
McAFB-008	Identifying and Taking Action for Non-Aqueous Phase Liquids During Subsurface Drilling	☐	☒
McAFB-009	Use of the Soil Moisture Quickdraw Tensiometer	☐	☒
McAFB-010	Aquifer Testing - Pumping and Slug Tests	☐	☒
McAFB-043	Step-Drawdown Test	☐	☒
McAFB-011	Air Permeability Testing	☐	☒
McAFB-012	Trenching	☐	☒
McAFB-013	Sampling Groundwater from Monitoring and Extraction Wells	☐	☒
McAFB-014	Sampling Groundwater with HydroPunch® I and II Samplers	☐	☒

McAFB-015	Collection of Sediment Samples in Ponds, Surface Impoundments, and Streambeds	☐	☒
McAFB-032	Surface Water Sampling	☐	☒
McAFB-016	Collection of Surface and Subsurface Soil Samples	☒	☐
McAFB-017	Soil Gas Sampling	☒	☐
McAFB-018	Surface Emission Flux Sampling	☐	☒
McAFB-019	Downhole Emission Flux Sampling	☐	☒
McAFB-034	Surface and Subsurface Field Screening for Low Level Radioactive Contamination	☐	☒
McAFB-020	Field Instrument: Photoionization Detector (PID) Calibration and Operation	☒	☐
McAFB-021	Field Instrument: Flame Ionization Detector (FID) Calibration and Operation	☐	☒
McAFB-023	Ensys Inc. Immunoassay Test Kit Procedures for PCBs and Petroleum Fuels	☐	☒
McAFB-024	Field Instrument: Calibration and Operation of Water Sampling Field Instruments	☐	☒
McAFB-033	Air Sampling Flow Controller Calibration	☐	☒
McAFB-038	Radiation Detection Instrument General Operation and Performance Check	☐	☒
McAFB-025	MTI Microchip GC	☐	☒
McAFB-026	Methanol Preservation Procedures for VOCs in Soil	☐	☒
McAFB-027	Field Soil Gas Analysis Using GC with PID and ECD	☐	☒
McAFB-028	Data Review Procedures	☒	☐
McAFB-029	Data Validation Standard Operating Procedure	☐	☒
McAFB-030	Data Exchange Protocol	☒	☐
McAFB-031	Prefractionator Method for Vinyl Chloride Analysis	☐	☒
McAFB-035	Sample Preparation and Analysis for Radium-228 Activity in Aqueous Samples	☐	☒
McAFB-036	Sample Preparation and Analysis for Tritium in Aqueous Solutions	☐	☒
McAFB-037	Sample Preparation and Analysis for Radioactive Strontium in Aqueous Samples	☐	☒
McAFB-039	Total Digestion of Soil, Sludges, Ashed Vegetation, and Air Filters for Radiochemical Analysis	☐	☒
McAFB-040	Actinide Sample Preparation, Nuclide Separation and Analysis	☐	☒
McAFB-044	Sample Preparation and Analysis for Gamma Activity in Solids	☐	☒

QUALITY ASSURANCE PROJECT PLAN
APPLICABILITY STATEMENT

The McClellan AFB Quality Assurance Project Plan (QAPP) Revision 3, dated April 97 (Revision Date) is sufficient for project quality control during performance of the work specified in the attached field sampling plan, which is:

Titled: Draft Sampling and Analysis Plan To Support Recommendation for No Further Investigation at SA 6

Dated: October 1997

The attached QAPP Applicability Checklist designates the applicable sections and SOPs of the QAPP.

Michael B. Phelps — Supplier Program Manager

Fred Stanin — Supplier Quality Assurance Officer

9/30/97 — Date

APPENDIX B

COMMENTS TO DRAFT SAMPLING AND ANALYSIS PLAN FROM REGIONAL WATER QUALITY CONTROL BOARD

Environmental Management
Attention: Ms. Elaine Anderson
SM-ALC/EMR
5050 Dudley Boulevard, Suite 3
McClellan AFB, CA 95652-1389

DRAFT SAMPLING AND ANALYSIS PLAN TO SUPPORT RECOMMENDATION FOR NO FURTHER INVESTIGATION AT SA 6, MC CLELLAN AFB

Thank you for the opportunity to review the subject report. Regional Board staff have completed the review and we have the following comments:

As a first step, we recommend collection of soil vapor samples from all piezometers found at clusters PZ-91, VMP 1 and VMP 2. The samples would be collected only after sufficient time has elapsed from turning off the bioventing unit and allowing the system to come into equilibrium. Additional boring and soil sampling would take place after receipt and review of the data from the soil vapor sampling effort. The soil vapor data may indicate that significant contamination still remains and the bioventing system should be operated for a longer period of time. The results may also indicate additional appropriate depths from which to collect soil samples. We also recommend the collection of PID readings from the soil vapor wells just prior to collection of the soil vapor samples.

Given that benzene was detected in the groundwater beneath the site, soil samples collected from the vadose zone to the water table will be necessary .

We recommend moving the middle proposed boring to just west of EW 279 since the initial concentrations were significant at that location and are unknown next to VMP-2. If data near VMP-2 is available, our recommendation could change. We further recommend a boring north of PZ 91 in the vicinity of the wastewater line that runs east-west across the top of the tank site. Significant contamination remained after soil excavation due to the inability to excavate further due to the wastewater line.

We recommend continuous coring of the borings so as to best select the intervals for sampling. The current proposal calls for collecting the samples every ten feet. We would skip the collection of the first ten-foot sample as contamination from the tank site was likely below that depth. We would recommend collection of the first sample at a depth of 20 feet.

These comments should be considered when finalizing the SAP for the project.

If you have any questions regarding this matter, please call me at (916) 255-3025.

ALEXANDER MACDONALD
Senior Engineer

cc: Ms. Debra Soper, Environmental Management, McClellan AFB

APPENDIX B
SOIL BORING LOGS

PARSONS ENGINEERING SCIENCE, INC.

BORING NUMBER: SB-026

PROJECT NUMBER: 726876-36320	**PROJECT NAME:** McClellan Air Force Base, Operable Unit B Site Study Area 6 (SA6) Closure Sampling/Drilling
CLIENT: AFCEE	
LOCATION: SA6, South of builing 656, approx. 40ft. North of piezometer 91	**DRILLING METHOD:** Hollow Stem Auger (CME 75)
GEOLOGIST: Amanda Freeman Bielskis	**HOLE DIAMETER:** 8 inches
COMPLETION DATE: 10/14/98	**TOTAL DEPTH:** 40 feet below ground surface

DEPTH (feet)	GW DEPTH	SAMPLE NUMBER	HEADSPACE PID/TVH (ppmv)	SAMPLE	BREATHING ZONE (ppm)	USCS CLASSIFICATION	GEOLOGIC DESCRIPTION
0							Asphalt (12"thick) FILL: loam, loose
5					0.0		
10					0.0		
15					0.0		
			1.8/6			SM	silty SAND: reddish brown, micaceous, subround-subangular, damp, loose, sand is fine-med grained,
			2.0/4				
20			25/6				
			2.8/6		0.0		
		IC06B026 23-23.5	3.0/20	■			
25			2.1/6				
			2.2/8			ML	Clayey SILT: stiff, grey color, minor sand (<5%)
			1.8/4		0.0		
			2.5/4				
30			2.0/4				
			3.6/10				
			1.9/14		0.0		
35			1.6/20			SM	silty SAND: micaceous
					0.0		
			1.1/44				
		IC06B026 38.5-39	1.4/84	■			
			1.1/2		0.0		
40		IC06B026 40-40.5	0.8/0	■		ML	clayey SILT w/minor sand

- - - Contact approximately located.

▽ - First encountered groundwater level.

▼ - Equilibrated groundwater level.

PID - Photoionization detector reading.

TVH - Total Volatile Hydrocarbon meter reading.

■ - Indicates sample submitted to laboratory for analysis

PARSONS ENGINEERING SCIENCE, INC.

BORING NUMBER: SB-027

PROJECT NUMBER: 726876-36320	**PROJECT NAME:** McClellan Air Force Base, Operable Unit B Site Study Area 6 (SA6) Closure Sampling/Drilling
CLIENT: AFCEE	
LOCATION: SA6, South of builing 656, SE of former building 657	**DRILLING METHOD:** Hollow Stem Auger (CME 75)
GEOLOGIST: Amanda Freeman Bielskis	**HOLE DIAMETER:** 8 inches
COMPLETION DATE: 10/16/98	**TOTAL DEPTH:** approx. 54 feet bgs

DEPTH (feet)	GW DEPTH	SAMPLE NUMBER	HEADSPACE PID/TVH (ppmv)	SAMPLE	BREATHING ZONE (ppm)	USCS CLASSIFICATION	GEOLOGIC DESCRIPTION
0							Asphalt (12"thick) FILL: loam
15			52/54 74.1/78 34.2/40			ML	Clayey SILT, stiff clayey SILT, w/fine sand
20			35.8/22 28.5/18 3.3/20		0.0	SM	sandy SILT silty SAND, vf sand
25		IC06SB027 24.5-25	99.6/112 15.0/38 3.1/36	■	0.0	CL	SILT, gray silty CLAY, clayey SILT
30			0.0/10 108/110 0.0/40		0.0	ML	SILT, gray
35			4.9/22 3.2/80 0.0/18		0.0	SM	Silty SAND, vf sand, well sorted
40		IC06SB027 41.5-42	22.5/28 15.5/24 30/56 0.0/0	■			
45			0.0/8 10.0/80			ML	SILT, gray, stiff, Fe staining
50			2.3/50 0.7/18 0.0/0		0.0		clayey SILT w/minor sand
55		IC06SB027 53-53.5	15.2/10 9.9/12	■		SP	SAND, fine-med. Grained, well sorted, micaceous

– – - Contact approximately located. PID - Photoionization detector reading. ■ - Indicates sample submitted to laboratory for analysis

▽ - First encountered groundwater level. TVH - Total Volatile Hydrocarbon meter reading.

PARSONS ENGINEERING SCIENCE, INC.

BORING NUMBER: SB-028

PROJECT NUMBER: 726876-36320	**PROJECT NAME:** McClellan Air Force Base, Operable Unit B Site Study Area 6 (SA6) Closure Sampling/Drilling
CLIENT: AFCEE	
LOCATION: SA6, South of builing 656, east of former building 657	**DRILLING METHOD:** Hollow Stem Auger (CME 75)
GEOLOGIST: Amanda Freeman Bielskis	**HOLE DIAMETER:** 8 inches
COMPLETION DATE: 10/16/98	**TOTAL DEPTH:** 58.5 feet below ground surface

DEPTH (feet)	GW DEPTH	SAMPLE NUMBER	HEADSPACE PID/TVH (ppmv)	SAMPLE	BREATHING ZONE (ppm)	USCS CLASSIFICATION	GEOLOGIC DESCRIPTION
0							Asphalt (12"thick)
							FILL: loam, loose, cuttings = 2.6ppm with PID
5							
10					0.0		
15							
		IC06SB028 16-16.5	778/500	■		SM	silty SAND:fine-med grained,
		IC06SB028 16.5-17	2065/8000			CL	silty CLAY, grey color, stiff, sand lenses within clay.
			238/400				
20						SP	SAND: v.fine grained, yellow brown.
			202/120				
			20.2/40				
			16.7/58				
25			77.0/20		0.0		
			0.0/10				
						CL	Silty CLAY: very stiff - hard, Fe staining,
30			4.9/220				
			2.6/38				
			1.1/18				
						SM	silty SAND/sandy SILT: some clay lenses, very fine grained sand, well sorted
35		IC06SB028 35-35.5	109/140	■			
					0.0		
			0.9/10				
			4.6/20				
40			24/42				

- - - Contact approximately located.

▽ - First encountered groundwater level.

▼ - Equilibrated groundwater level.

PID - Photoionization detector reading.

TVH - Total Volatile Hydrocarbon meter reading.

■ - Indicates sample submitted to laboratory for analysis

BORING NUMBER: SB-028

PROJECT NUMBER: 726876-36320	**PROJECT NAME:** McClellan Air Force Base, Operable Unit B Site Study Area 6 (SA6) Closure Sampling/Drilling
CLIENT: AFCEE	
LOCATION: SA6, South of builing 656, east of former building 657	**DRILLING METHOD:** Hollow Stem Auger (CME 75)
GEOLOGIST: Amanda Freeman Bielskis	**HOLE DIAMETER:** 8 inches
COMPLETION DATE: 10/16/98	**TOTAL DEPTH:** 58.5 feet below ground surface

DEPTH (feet)	GW DEPTH	SAMPLE NUMBER	HEADSPACE PID/TVH (ppmv)	SAMPLE	BREATHING ZONE (ppm)	USCS CLASSIFICATION	GEOLOGIC DESCRIPTION
40			5.2/40				
			4.4/12				
			20.2/12				
45			1.0/0				
			0.6/0			ML	clayey SILT, gray
			3.1/4				
50		IC06SB028 50-50.5	0.0/4	■			
			6.7/2				
			0.4/0		0.0	CL	Silty CLAY, brown, damp, stiff, mica
55			0.7/0		0.0		
			1.1/0				
60							

- - - Contact approximately located.

▽ - First encountered groundwater level.

▼ - Equilibrated groundwater level.

PID - Photoionization detector reading.

TVH - Total Volatile Hydrocarbon meter reading.

■ - Indicates sample submitted to laboratory for analysis

PARSONS ENGINEERING SCIENCE, INC.

BORING NUMBER: SB-029

PROJECT NUMBER: 726876-36320	**PROJECT NAME:** McClellan Air Force Base, Operable Unit B Site Study Area 6 (SA6) Closure Sampling/Drilling
CLIENT: AFCEE	
LOCATION: SA6, South of builing 656, northeast of former building 657	**DRILLING METHOD:** Hollow Stem Auger (CME 75)
GEOLOGIST: Amanda Freeman Bielskis	**HOLE DIAMETER:** 8 inches
COMPLETION DATE: 10/16/98	**TOTAL DEPTH:** 115 feet below ground surface

DEPTH (feet)	GW DEPTH	SAMPLE NUMBER	HEADSPACE PID/TVH (ppmv)	SAMPLE	BREATHING ZONE (ppm)	USCS CLASSIFICATION	GEOLOGIC DESCRIPTION
0							Asphalt (12"thick)
							FILL: loam
5							
10					0.0		
15			115/200			SM	silty SAND: micaceous, fine-med grained, brownish reddish
			209/180				
		IC06SB029 19.5-20 (DUP)	579/420				
20			675/500				
		IC06SB029 20-20.5	45.1/220				(Staining 20-23ft bgs, strong odor)
			39.3/210				
25			24.4/200		0.0	ML	Clayey SILT
			2.2/180				
			43.7/180			CL	Silty CLAY: grey-brown, damp, stiff
30			48.0/180				
		IC06SB029 32-32.5	316/300				(Odors)
			17.0/160				
35						ML	Clayey SILT, stiff
			10.9/200		0.0		(Odors)
			2.7/200				
			7.1/200			SM	silty SAND: very fine - fine grained sand.
40							(O to 40 feet drilled 10/14/98)

- - - Contact approximately located.

▽ - First encountered groundwater level.

▼ - Equilibrated groundwater level.

PID - Photoionization detector reading.

TVH - Total Volatile Hydrocarbon meter reading.

■ - Indicates sample submitted to laboratory for analysis.

BORING NUMBER: SB-029

PROJECT NUMBER: 726876-36320	**PROJECT NAME:** McClellan Air Force Base, Operable Unit B Site Study Area 6 (SA6) Closure Sampling/Drilling
CLIENT: AFCEE	
LOCATION: SA6, South of builing 656, northeast of former building 657	**DRILLING METHOD:** Hollow Stem Auger (CME 75)
GEOLOGIST: Amanda Freeman Bielskis	**HOLE DIAMETER:** 8 inches
COMPLETION DATE: 10/14-15/98	**TOTAL DEPTH:** 115 feet below ground surface

DEPTH (feet)	GW DEPTH	SAMPLE NUMBER	HEADSPACE PID/TVH (ppmv)	SAMPLE	BREATHING ZONE (ppm)	USCS CLASSIFICATION	GEOLOGIC DESCRIPTION
40			13.3/240			SP	SAND, very fine - fine grained, damp
			1.6/70				
			1.1/74				
45			2.7/240				
			6.1/360			CL	Silty CLAY, stiff
						SM	Silty SAND, w/minor clay, very fine sand
			9.5/260			ML	clayey SILT, stiff, w/sand interbedded
50			11.0/200				
			3.0/90				
			3.5/80		0.0		
55			1.6/74		0.0		
			1.9/100				
			7.0/300				
			9.0/100			CL	Silty CLAY/clayey SILT: minor vf sand, very stiff, plastic
60			1.0/62				
		IC06SB029 62-62.5	33.6/120				
			3.7/84				
			0.7/110				
65			0.0/48				
						CL	Silty CLAY: lt. Brown/gray, plastic
			0.6/110				
			1.7/160				
70			1.0/140				
			0.0/600				
			0.0/140			SM	Sandy SILT, vf sand.
			0.0/100				
75			0.0/100				
			0.0/200				
80			0.0/0?				

- - - Contact approximately located.

▽ - First encountered groundwater level.

▼ - Equilibrated groundwater level.

PID - Photoionization detector reading.

TVH - Total Volatile Hydrocarbon meter reading.

■ - Indicates sample submitted to laboratory for analysis

BORING NUMBER: SB-029

PROJECT NUMBER: 726876-36320	**PROJECT NAME:** McClellan Air Force Base, Operable Unit B Site Study Area 6 (SA6) Closure Sampling/Drilling
CLIENT: AFCEE	
LOCATION: SA6, South of builing 656, northeast of former building 657	**DRILLING METHOD:** Hollow Stem Auger (CME 75)
GEOLOGIST: Amanda Freeman Bielskis	**HOLE DIAMETER:** 8 inches
COMPLETION DATE: 10/14-15/98	**TOTAL DEPTH:** 115 feet below ground surface

DEPTH (feet)	GW DEPTH	SAMPLE NUMBER	HEADSPACE PID/TVH (ppmv)	SAMPLE	BREATHING ZONE (ppm)	USCS CLASSIFICATION	GEOLOGIC DESCRIPTION
80			0.0/56				
			0.0/60			CL	Silty CLAY, gray with Fe staining, stiff,
			0.0/42				
85			0.0/38			SP	SAND, fine - med., micaceous, damp, well sorted, subrounded.
		IC06SB029 88-88.5		■			
			0.0/110				
90						CL	CLAY, stiff, gray, very tight, thin interbeds of fine sand.
			0.0/4				
			0.0/58		0.0		
95			0.0/40		0.0		
			0.3/40				
100			0.0/42				
			0.0/44				
			0.0/56			SP	SAND, fine grained, well sorted,
			0.0/42				
105			0.0/24				
						CL	CLAY, very stiff, gray,
			0.0/0				
110			0.0/0				
			0.0/0				
115	▽		0.0/0				

- - - Contact approximately located.

▽ - First encountered groundwater level.

▼ - Equilibrated groundwater level.

PID - Photoionization detector reading.

TVH - Total Volatile Hydrocarbon meter reading.

■ - Indicates sample submitted to laboratory for analysis

APPENDIX C
LABORATORY ANALYTICAL RESULTS

McClellan
SA6

SPECIALIZED ASSAYS INC. • 2960 Foster Creighton Dr. • P.O. Box 40566 • Nashville, Tennessee 37204-0566
615-726-0177 • 1-800-765-0980 • Fax 615-726-3404

Case Narrative
SDG 117264
11/10/98

Client: **Parsons Engineering Sciences, Inc.**
2101 Webster Street, Suite 700
Oakland, CA 94612

Client Project Number: 726876.36320 **Matrix: Water/Soil**

Laboratory Project Number: 8185 **Number of Samples: 1 Water/ 15 Soil**

Date Received: 10/17/98 **Date Collected: 10/14/98 through 10/16/98**

Sample Receipt

One water and fifteen soil samples were received in good condition on 10/17/98. Analysis was requested for benzene, toluene, ethylbenzene, and xylenes (BTEX), and total petroleum hydrocarbons (TPH) gasoline range organics (GRO) and diesel range organics (DRO). Analysis was based on Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). Specific methods used include BTEX by Method 8021B and GRO/DRO by Method 8015M.

BTEX, Method 8021B and TPH-GRO, Method 8015B

Samples submitted for BTEX and TPH-GRO analysis exhibited acceptable surrogate recoveries. Matrix spike/matrix spike duplicate (MS/MSD) analysis was conducted sample on a sample from another delivery group for the water fraction and sample IC06SB028 (16-16.5) for the soil fraction. Gasoline fuel standards showed acceptable recovery and RPD value for both MS/MSD pairs. The laboratory control sample (LCS) associated with each matrix was within control. All instrument QC was within laboratory and method specified limits. The samples were not processed to report the practical quantitation limits specified for this project due to an oversight at the bench. When the error was noted, the samples were out of holding time. The data has been reported with the standard Specialized Assays reporting limits.

TPH-DRO, Method 8015B

Surrogates were diluted out of range for sample IC06SB028 due to the twenty-fold dilution factor required to report DRO within calibration range. Sample ICS06SB028 was also specified for MS/MSD analysis. Due to the high concentration of DRO (exceeded calibration range) in the native sample, MS/MSD recoveries and RPD values were outside of control limits. The LCS associated with this batch acceptable recovery of the spiked diesel fuel standard.

Paula Watts, MS
Technical Services
Specialized Assays

SPECIALIZED ASSAYS INC. • 2960 Foster Creighton Dr. • P.O. Box 40566 • Nashville, Tennessee 37204-0566
615-726-0177 • 1-800-765-0980 • Fax 615-726-3404

SPECIALIZED ASSAYS

Table of Contents
Sample Delivery Group: 117264

P[illegible] SC[illegible]
E[illegible]GIN[illegible]RI[illegible]
SCIENCE, INC.
2101 Webster Street, Suite 700
[illegible]kland, California 94612
Phone: (510) 891-9085
FAX: (510) 835-4355

CHAIN OF CUSTODY RECORD

177269

Project No.: 726876.36320 Lab Account No.: 8185

Project Name/Location: McClellan AFB; SA6

Site Manager: Michael Phelps (Oakland, CA)

Project Manager: John Ratz (Denver, CO)

Samplers: (Initials and Signatures)

Bruce Schlatter
Specialized Assays Inc. (SAI)
2960 Foster Creighton Drive
Nashville, TN 37204
(615) 726-0177
Fax:(615) 726-3404

Sample ID	Date	Time	QC (MS/ MSD)	Matrix	NO. OF CONTAINERS	ANALYTES (METHOD) ORGANICS: BTEX (8020A)	INORGANICS	OTHER	Remarks
FC06B029	10/15/98	1725		water	4	X			127363
				water					
				water					
				water					
				water					
				water					
				water					
				water					
				water					
				water					
				water					
				water					
				water					

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
	10/15/98	530			
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED FOR LAB BY: (SIGNATURE)	DATE	TIME
				10/17/98	9:00

GENERAL COMMENTS/INSTRUCTIONS:
1. FAX chain-of-custody on check-in to site manager (Phelps).
2. QC [illegible]d reporting limits of contract 726876.3016.00 must be met.
3. Option 2 pricing applies and IRPIMS electronic deliverable IS requi

Distribution: Original accompanies shipment; photocopy kept by samplers; copy FAXed to Parsons ES Site Manager by laboratory upon receipt of samples.

PARSONS ENGINEERING SCIENCE, INC.
[redacted]101 [redacted]ster [redacted]et, S[redacted]0 [redacted]
Oakland, California 94612
Phone: (510) 891-9085
FAX: (510) 835-4355

CHAIN OF CUSTODY RECORD

Project No.: 726876.36320 Lab Account No.: 8185

Project Name/Location: McClellan AFB; SA6

Site Manager: Michael Phelps (Oakland, CA)

Project Manager: John Ratz (Denver, CO)

Samplers: (Initials and Signatures)

Lab: Bruce Schlatter
Specialized Assays Inc. (SAI)
2960 Foster Creighton Drive
Nashville, TN 37204
(615) 726-0177
Fax:(615) 726-3404

000033

Sample ID	Date	Time	Begin Depth	End Depth	Matrix	NO. OF CONTAINERS	ANALYTES (METHOD) ORGANICS: TPH-gasoline/GRO (8015M)	Extract. TPH/DRO (8015M)	Leachable TPH (DI-WET/8015M) note 1	BTEX (8020A)	INORGANICS: Moisture Content (ASTM D-2216)	OTHER	Sample Remarks
IC06SB026	10/14/98	1045	23	23.5	soil	1	X	X	X	X	X		127364
IC06SB026	"	1046	23.5	24	soil	1					X		HOLD
IC06SB026	"	1116	36.5	37	soil	1					X		HOLD DO NOT RU
IC06SB026	"	1112	37	37.5	soil	1					X		HOLD DO not RU
IC06SB026	"	1115	39.5	40	soil	1					X		HOLD
IC06SB026		1116	40	40.5	soil	1					X		127365
IC06SB026		1105	35.5	36	soil	1					X		HOLD
IC06SB026		1114	38.5	~~40~~ 39 (AF)	soil	1					X		127366
IC06SB029	"	1335	18.5	19	soil	1					X		HOLD
IC06SB029		1340	19	19.5	soil	1					X		127367
IC06SB029		1340	20	20.5	soil	1					X		HOLD
IC06SB029		1341	20.5	21	soil	1					X		127368

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
	10/16/98				
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED FOR LAB BY: (SIGNATURE)	DATE	TIME
				10/17/98	9:00

SPECIFIC ANALYTICAL METHOD FOOTNOTES:
1. Deionized water extraction (California Title 22 method); DO LEACHABLE ONL IF TOTAL TPH IS DETECTED AND AFTER CONSULTATION WITH SITE MANAGER (PHELPS).

GENERAL COMMENTS/INSTRUCTIONS:
1. FAX chain-of-custod[redacted]n check-in to site manager (Phelps).
2. QC and reporting limits of contract 726876.3016.00 must be met.
3. Option 2 pricing applies and IRPIMS electronic deliverable IS required.

Distribution: Original accompanies shipment; photocopy kept by samplers; copy FAXed to Parsons ES Site Manager by laboratory upon receipt of samples.

PARSONS ENGINEERING SCIENCE, INC.
1015 Tyler Street, Suite 100
Oakland, California 94612
Phone: (510) 891-9085
FAX: (510) 835-4355

CHAIN OF CUSTODY RECORD

000034

Project No.: 726876.36320 Lab Account No.: 8185

Project Name/Location: McClellan AFB; SA6

Site Manager: Michael Phelps (Oakland, CA)

Project Manager: John Ratz (Denver, CO)

Samplers: (Initials and Signatures)

Lab: Bruce Schlatter
Specialized Assays Inc. (SAI)
2960 Foster Creighton Drive
Nashville, TN 37204
(615) 726-0177
Fax:(615) 726-3404

Sample ID	Date	Time	Begin Depth	End Depth	Matrix	NO. OF CONTAINERS	ORGANICS: TPH-gasoline/GRO (8015M)	ORGANICS: Extract. TPH/DRO (8015M)	ORGANICS: Leachable TPH (DI-WET/8015M) note 1	ORGANICS: BTEX (8020A)	INORGANICS: Moisture Content (ASTM D-2216)	Sample Remarks
ICO6 SB029	10/14/98	1425	32.5	33	soil	1	X	X	X	X	✓	127369
ICO6 SB029	"	1425	31.5	32	soil	1	X	X	X	X	✓	#22.0
ICO6 SB029	10/15/98	1001	62	62.5	soil	1	X	X	X	X	✓	127370
ICO6 SB029	"	955	61	61.5	soil	1	X	X	X	✓	✓	HOLD
ICO6 SB029	"	1330	87	87.5	soil	1	X	X	X	✓	✓	HOLD
ICO6 SB029	"		88	88.5	soil	1	X	X	✓	✓	✓	127371
					soil							
					soil							
					soil							
					soil							
					soil							
					soil							

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
	10/16/98				
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED FOR LAB BY: (SIGNATURE)	DATE	TIME
			Pat R Burke	10/17/98	9:00

SPECIFIC ANALYTICAL METHOD FOOTNOTES:
1. Deionized water extraction (California Title 22 method); DO LEACHABLE ONL IF TOTAL TPH IS DETECTED AND AFTER CONSULTATION WITH SITE MANAGER (PHELPS).

GENERAL COMMENTS/INSTRUCTIONS:
1. FAX chain-of-custody n check-in to site manager (Phelps).
2. QC and reporting limits of contract 726876.3016.00 must be met.
3. Option 2 pricing applies and IRPIMS electronic deliverable IS required.

Distribution: Original accompanies shipment; photocopy kept by samplers; copy FAXed to Parsons ES Site Manager by laboratory upon receipt of samples.

PARSONS ENGINEERING SCIENCE, INC.
2100 Webster Street, 7th Floor
Oakland, California 94612
Phone: (510) 891-9085
FAX: (510) 835-4355

CHAIN OF CUSTODY RECORD

Project No.: 726876.36320 Lab Account No.: 8185

Project Name/Location: McClellan AFB; SA6

Site Manager: Michael Phelps (Oakland, CA)

Project Manager: John Ratz (Denver, CO)

Samplers: (Initials and Signatures)

Lab: Bruce Schlatter
Specialized Assays Inc. (SAI)
2960 Foster Creighton Drive
Nashville, TN 37204
(615) 726-0177
Fax:(615) 726-3404

000035

Sample ID	Date	Time	Begin Depth	End Depth	Matrix	NO. OF CONTAINERS	ANALYTES (METHOD) ORGANICS: TPH-gasoline/GRO (8015M)	Extract. TPH/DRO (8015M)	Leachable TPH (DI-WET/8015M) note 1	BTEX (8020A)	INORGANICS: Moisture Content (ASTM D-2216)	Sample Remarks
												127372
ICO6SB028	10/16/98	840	16	16.5	soil	1	X	X	X	X	X	Matr.Spike/MSDup
ICO6SB028		845	16.5	17	soil	1	X	X	X	X	X	127373
ICO6SB028		846	17.5	18	soil	1	X	X	X	X	X	HOLD
ICO6SB028		935	35	35.5	soil	1	X	X	X	X	X	127374
ICO6SB028		930	34	34.5	soil	1	X	X	X	X	X	HOLD
ICO6SB028		1050	50	50.5	soil	1	X	X	X	X	X	127375
ICO6SB028		1051	50.5	51	soil	1	X	X	X	X	X	HOLD
ICO6 SB28		1215	24.5	25	soil	1	X	X	X	X	X	127376
ICO6SB027	10/16/98	1218	25.5	26	soil	1	X	X	X	X	X	HOLD
ICO6SB027	"	1302	41.5	42	soil	1	X	X	X	X	X	127377
ICO6SB027	"	1300	41	41.5	soil	1	X	X	X	X	X	HOLD
					soil							

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
	10/16/98				
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED FOR LAB BY: (SIGNATURE)	DATE	TIME
				10/17/98	0900

SPECIFIC ANALYTICAL METHOD FOOTNOTES:
1. Deionized water extraction (California Title 22 method); DO LEACHABLE ON IF TOTAL TPH IS DETECTED AND AFTER CONSULTATION WITH SITE MANAGER (PHELPS).

GENERAL COMMENTS/INSTRUCTIONS:
1. FAX chain-of-custody check-in to site manager (Phelps).
2. QC and reporting limits of contract 726876.3016.00 must be met.
3. Option 2 pricing applies and IRPIMS electronic deliverable IS required.

Distribution: Original accompanies shipment; photocopy kept by samplers; copy FAXed to Parsons ES Site Manager by laboratory upon receipt of samples.

PARSONS ENGINEERING SCIENCE, INC.
2101 Webster Street, Suite 700
Oakland, California 94612
Phone: (510) 891-9085
FAX: (510) 835-4355

CHAIN OF CUSTODY RECORD

Project No.: 726876.36320 Lab Account No.: 8185

Project Name/Location: McClellan AFB; SA6

Site Manager: Michael Phelps (Oakland, CA)

Project Manager: John Ratz (Denver, CO)

Samplers: (Initials and Signatures)

Lab: Bruce Schlatter
Specialized Assays Inc. (SAI)
2960 Foster Creighton Drive
Nashville, TN 37204
(615) 726-0177
Fax:(615) 726-3404

Sample ID	Date	Time	Begin Depth	End Depth	Matrix	NO. OF CONTAINERS	ANALYTES (METHOD) ORGANICS: TPH-gasoline/GRO (8015M)	Extract. TPH/DRO (8015M)	Leachable TPH (DI-WET/8015M) note 1	BTEX (8020A)	INORGANICS: Moisture Content (ASTM D-2216)	OTHER	Sample Remarks
ICO6SB027	10/16/98	1420	53	53.5	soil	1	X	X	X	X	X		127378
ICO6SB027	"	1425	52	52.5	soil	1	X	X	X	X	X		HOLD
					soil								
					soil								
					soil								
					soil								
					soil								
					soil								
					soil								
					soil								
					soil								
					soil								

000006

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
[signature]	10/16/98				
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED FOR LAB BY: (SIGNATURE)	DATE	TIME
			[signature]	10/17/98	9:00

SPECIFIC ANALYTICAL METHOD FOOTNOTES:
1. Deionized water extraction (California Title 22 method); DO LEACHABLE C IF TOTAL TPH IS DETECTED AND AFTER CONSULTATION WITH SITE MANAGER (PHELPS).

GENERAL COMMENTS/INSTRUCTIONS:
1. FAX chain-of-custody on check-in to site manager (Phelps).
2. QC and reporting limits of contract 726876.3016.00 must be met.
3. Option 2 pricing applies and IRPIMS electronic deliverable IS required.

Distribution: Original accompanies shipment; photocopy kept by samplers; copy FAXed to Parsons ES Site Manager by laboratory upon receipt of samples.

Cooler Receipt Form

Client: PARSONS

Cooler Received On: 10/17/98 And Opened On: 10/17/98 By: PAM R Buckingham

(Signature)

1. Temperature of Cooler when opened 4°C
2. Were custody seals on outside of cooler and intact? (Yes) No
   a. If yes, what kind and where: 2 front / back
   b. Were the signature and date correct? (Yes) No
3. Were custody papers inside cooler? (Yes) No
4. Were custody papers properly filled out (ink, signed, etc)? (Yes) No
5. Did you sign the custody papers in the appropriate place? (Yes) No
6. What kind of packing material was used? bubble wrap
7. Was sufficient ice used (if appropriate)? (Yes) No
8. Did all bottles arrive in good condition (unbroken)? PRB (Yes) No *
9. Were all bottle labels complete (#, date, signed, pres, etc)? (Yes) No
10. Did all bottle labels and tags agree with custody papers? (Yes) No
11. Were correct bottles used for the analysis requested? (Yes) No
12. If present, were VOA vials checked for absence of air bubbles and noted if found? (Yes) No
13. Was sufficient amount of sample sent in each bottle? (Yes) No
14. Were correct preservatives used? (Yes) No
15. Corrective action taken, if necessary: * Two "on hold" samples were not rec'd
    a. Name of person contacted:
    b. Date

000007

800000

SPL11

FedEx. USA Airbill — FedEx Tracking Number 800688993086

0200 Form I.D. No. **FedEx Retrieval Copy**

1 From

Date 2/16/93 Sender's FedEx Account Number 1497-7673-7

Sender's Name Amanda Freeman Phone (510) 891-9085

Company PARSONS ENG SCIENCES INC

Address 2101 WEBSTER ST 7TH FL Dept/Floor/Suite/Room

City OAKLAND State CA ZIP 94612

2 Your Internal Billing Reference Information 726876 36320

3 To

Recipient's Name D. Roberts/B. Schlatter Phone 615 726-0177

Company Specialized Assays Inc. (SAI)

Address 2960 Foster Creighton Dr Dept/Floor/Suite/Room

☐ Check here if residence

City Nashville State TN ZIP 37204

For HOLD at FedEx Location check here: Hold Weekday 31 ☐ Hold Saturday

For Saturday Delivery check here: 3 ☒

4a Express Package Service *Packages under 150 lbs.*

1 ☒ FedEx Priority Overnight 5 ☒ FedEx Standard Overnight 3 ☐ FedEx 2Day* 20 ☐ FedEx Express Saver* 6 ☐ FedEx First Overnight

4b Express Freight Service *Packages over 150 lbs.*

7 ☐ FedEx Overnight Freight 8 ☐ FedEx 2Day Freight 83 ☐ FedEx Express Saver Freight

(Call for delivery schedule. See back for detailed descriptions of freight services.)

5 Packaging 6 ☐ FedEx Letter 2 ☐ FedEx Pak 3 ☐ FedEx Box 4 ☐ FedEx Tube 1 ☒ Other Pkg.

6 Special Handling

Does this shipment contain dangerous goods? 4 ☐ Yes ☐ Yes

6 ☐ Dry Ice CA ☐ Cargo Aircraft Only

7 Payment

Bill to: 1 ☐ Sender 2 ☒ Recipient 3 ☐ Third Party 4 ☐ Credit Card 5 ☐ Cash/Check ☐ Obtain Recipient FedEx Account No.

Total Packages 1 Total Weight 4 Total Charges Credit Card Auth.

8 Release Signature

287

WCSL 0/97 Rev. Date 5/97

002920098 6

8 0 0 6 8 8 9 9 3 0 8 6

600000

fedEx. USA Airbill

FedEx Tracking Number 802558982010

Form I.D. No. 0200

Recipient's Copy

1 From

Date 10/16/98

Sender's Name Amanda Freeman Phone 501 771-9085

Company Parsons I.S.

Address 2101 Webster #1700

Dept/Floor/Suite/Room

City Oakland State CA ZIP 94612

2 Your Internal Billing Reference Information 726576-36320

3 To

Recipient's Name D Volcans/R Schlueter Phone (617) 726-0177

Company Advanced Assays Inc (SAT.)

Address 2760 Foster Crockett Dr. Check here if residence (Extra charge applies for FedEx Express Saver)

(HOLD at FedEx location, print FedEx address here)

Dept/Floor/Suite/Room

City Louisville State KY ZIP 27704

For HOLD at FedEx Location check here

- ☐ Hold Weekday (Not available with FedEx First Overnight)
- ☐ Hold Saturday (Not available at all locations) (Available for FedEx Priority Overnight and FedEx 2Day only)

For Saturday Delivery check here

- ☒ (Extra Charge. Not available in all locations) (Available for FedEx Priority Overnight and FedEx 2Day only)

802558982010

4a Express Package Service *Packages under 150 lbs.* Delivery commitment may be later in some areas.

- ☒ FedEx Priority Overnight (Next business morning)
- ☐ FedEx Standard Overnight (Next business afternoon)
- ☐ FedEx First Overnight (Earliest next business morning delivery to select locations) (Higher rates apply)
- ☐ FedEx 2Day (Second business day)
- ☐ FedEx Express Saver (Third business day)

FedEx Letter Rate not available. Minimum charge: One pound rate.

4b Express Freight Service *Packages over 150 lbs.* Delivery commitment may be later in some areas.

- ☐ FedEx Overnight Freight (Next business day)
- ☐ FedEx 2Day Freight (Second business day)
- ☐ FedEx Express Saver Freight (Up to 3 business days)

(Call for delivery schedule. See back for detailed descriptions of freight services.)

5 Packaging

- ☐ FedEx Letter
- ☐ FedEx Pak
- ☐ FedEx Box
- ☐ FedEx Tube
- ☒ Other Pkg.

Declared value limit $500.

6 Special Handling (One box must be checked)

Does this shipment contain dangerous goods?*

- ☐ No
- ☐ Yes (As per attached Shipper's Declaration)
- ☐ Yes (Shipper's Declaration not required)

- ☐ Dry Ice — Dry Ice, 9, UN 1845 ____ x ____ kg.
- CA ☐ Cargo Aircraft Only

*Dangerous goods cannot be shipped in FedEx packaging

7 Payment Obtain Recipient FedEx Account No

Bill to:

- ☐ Sender (Account no. in section 1 will be billed)
- ☒ Recipient
- ☐ Third Party
- ☐ Credit Card
- ☐ Cash/Check

(Enter FedEx account no. or Credit Card no. below)

Total Packages	Total Weight	Total Declared Value*	Total Charges
1	5.5	$ .00	$

Credit Card Auth.

*When declaring a value higher than $100 per shipment, you pay an additional charge. See SERVICE CONDITIONS, DECLARED VALUE, AND LIMIT OF LIABILITY section for further information.

8 Release Signature

Your signature authorizes Federal Express to deliver this shipment without obtaining a signature and agrees to indemnify and hold harmless Federal Express from any resulting claims.

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Questions?
Call 1-800-Go-FedEx (800)463-3339

Rev. Date 8/97
Part #151558
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SPECIALIZED ASSAYS INC. • 2960 Foster Creighton Dr. • P.O. Box 40566 • Nashville, Tennessee 37204-0566
615-726-0177 • 1-800-765-0980 • Fax 615-726-3404

Volatile Organic Compounds
Sample Results
and
Summary Data

Prepared by:

Specialized Assays, Inc.
2960 Foster Creighton Drive
Nashville, TN 37204

(615) 726-0177

000010

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06B029

Matrix: Water
pH:
Units: ug/l
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127363
Date Sampled:: 10/15/98
Date Received: 10/17/98
Analysis Date: 10/29/98
Analysis Time: 17:00
Sample QC Group: 1218

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	1.0	U
108-88-3	Toluene	1.0	U
100-41-4	Ethylbenzene	1.0	U
1330-20-7	Xylenes, total	1.0	U

SPECIALIZED ASSAYS INC. • 2960 Foster Creighton Dr. • P.O. Box 40566 • Nashville, Tennessee 37204-0566
615-726-0177 • 1-800-765-0980 • Fax 615-726-3404

Volatile Organic Compounds
Sample Results
and
Summary Data

Prepared by:

Specialized Assays, Inc.
2960 Foster Creighton Drive
Nashville, TN 37204

(615) 726-0177

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB026 23'-23.5'

Matrix: Soil
% Dry Weight: 77.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127364
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 10:34
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	130.	U
108-88-3	Toluene	130.	U
100-41-4	Ethylbenzene	130.	U
1330-20-7	Xylenes, total	130.	U

000076

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB026 23'-23.5'

Matrix: Soil
% Dry Weight: 77.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127364
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 10:34
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	1250	U

000077

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB026 40'-40.5'

Matrix: Soil
% Dry Weight: 80.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127365
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 12:03
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	125.	U
108-88-3	Toluene	125.	U
100-41-4	Ethylbenzene	125.	U
1330-20-7	Xylenes, total	125.	U

000078

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB026 40'-40.5'

Matrix: Soil
% Dry Weight: 80.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127365
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 12:03
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	1200	U

000079

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB026 38.5'-39'

Matrix: Soil
% Dry Weight: 81.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127366
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 12:32
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	123.	U
108-88-3	Toluene	123.	U
100-41-4	Ethylbenzene	123.	U
1330-20-7	Xylenes, total	123.	U

000080

COPY 1

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB026 38,5-39'

Matrix: Soil
% Dry Weight: 81.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127366
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 12:32
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	1190	.... U

000081

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB029 19-19.5'

Matrix: Soil
% Dry Weight: 90.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127367
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 13:02
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	111.	U
108-88-3	Toluene	111.	U
100-41-4	Ethylbenzene	111.	U
1330-20-7	Xylenes, total	111.	U

000082

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB029 19-19.5'

Matrix: Soil
% Dry Weight: 90.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127367
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 13:02
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	1070	U

000083

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB030 29 20.5'-21'

CBS 1/22/99

Matrix: Soil
% Dry Weight: 86.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127368
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 13:31
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	116.	U
108-88-3	Toluene	116.	U
100-41-4	Ethylbenzene	116.	U
1330-20-7	Xylenes, total	116.	U

000084

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB030 29 20.5'-21'

PBL 1/22/99

Matrix: Soil
% Dry Weight: 86.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127368
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 13:31
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	2190	....

000085

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB029 32.5-33'

Matrix: Soil
% Dry Weight: 80.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127369
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 14:01
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	125.	U
108-88-3	Toluene	125.	U
100-41-4	Ethylbenzene	125.	U
1330-20-7	Xylenes, total	125.	U

000086

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB029 32.5'-33'

Matrix: Soil
% Dry Weight: 80.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127369
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 14:01
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	1200	U

000087

COPY 1

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

ICO6SB029

62'-62.5'

Matrix: Soil
% Dry Weight: 79.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127370
Date Sampled: 10/15/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 14:30
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	127.	U
108-88-3	Toluene	127.	U
100-41-4	Ethylbenzene	127.	U
1330-20-7	Xylenes, total	127.	U

000083

COPY 1

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB029 62'-62.5'

Matrix: Soil
% Dry Weight: 79.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127370
Date Sampled: 10/15/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 14:30
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	1220	U

000089

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB029 88'-88.5'

Matrix: Soil
% Dry Weight: 60.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127371
Date Sampled: 10/15/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 15:00
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	167.	U
108-88-3	Toluene	167.	U
100-41-4	Ethylbenzene	167.	U
1330-20-7	Xylenes, total	167.	U

000090

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB029

88-35.5'

Matrix: Soil
% Dry Weight: 60.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127371
Date Sampled: 10/15/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 15:00
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	1600	U

000091

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB028

16'-16.5'

Matrix: Soil
% Dry Weight: 85.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127372
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 15:29
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	118.	U
108-88-3	Toluene	118.	U
100-41-4	Ethylbenzene	118.	U
1330-20-7	Xylenes, total	118.	U

000092

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB028 16'-16.5'

Matrix: Soil
% Dry Weight: 85.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127372
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 15:29
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	3790	....

000093

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB028 16.5'-17'

Matrix: Soil
% Dry Weight: 77.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127373
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 18:29
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	130.	U
108-88-3	Toluene	130.	U
100-41-4	Ethylbenzene	130.	U
1330-20-7	Xylenes, total	831.	

000094

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB028 16.5'-17'

Matrix: Soil
% Dry Weight: 77.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127373
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 18:29
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	8550	....

000095

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB028 35'-35.5'

Matrix: Soil
% Dry Weight: 81.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127374
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 18:59
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	123.	U
108-88-3	Toluene	123.	U
100-41-4	Ethylbenzene	123.	U
1330-20-7	Xylenes, total	123.	U

000096

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

ICO6SB028 35'-35.5'

Matrix: Soil
% Dry Weight: 81.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127374
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 18:59
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	1190	U

000097

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB028 50'-50.5'

Matrix: Soil
% Dry Weight: 80.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127375
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 19:28
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	125.	U
108-88-3	Toluene	125.	U
100-41-4	Ethylbenzene	125.	U
1330-20-7	Xylenes, total	125.	U

000098

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB028 50'-50.5'

Matrix: Soil
% Dry Weight: 80.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127375
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 19:28
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	1200	U

000093

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB027 24.5'-25'

Matrix: Soil
% Dry Weight: 76.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127376
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 19:58
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	132.	U
108-88-3	Toluene	132.	U
100-41-4	Ethylbenzene	132.	U
1330-20-7	Xylenes, total	132.	U

000100

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB027 24.5'-25'

Matrix: Soil
% Dry Weight: 76.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127376
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 19:58
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	1260	U

000101

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB027 41.5'-42'

Matrix: Soil
% Dry Weight: 82.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127377
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 20:27
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	122.	U
108-88-3	Toluene	122.	U
100-41-4	Ethylbenzene	122.	U
1330-20-7	Xylenes, total	122.	U

000102

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB027 41.5'-42'

Matrix: Soil
% Dry Weight: 82.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127377
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 20:27
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	1170	U

000103

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB027 53'-53.5'

Matrix: Soil
% Dry Weight: 77.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8260B
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127378
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 20:56
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	130.	U
108-88-3	Toluene	130.	U
100-41-4	Ethylbenzene	130.	U
1330-20-7	Xylenes, total	130.	U

000104

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB027 53'-53.5'

Matrix: Soil
% Dry Weight: 77.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument:

Lab Sample ID: 98-A127378
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/23/98
Analysis Time: 20:56
Sample QC Group: 2332

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Gasoline Range)	1250	U

000105

SPECIALIZED ASSAYS INC. • 2960 Foster Creighton Dr. • P.O. Box 40566 • Nashville, Tennessee 37204-0566
615-726-0177 • 1-800-765-0980 • Fax 615-726-3404

Total Petroleum Hydrocarbons
Diesel Range Organics
Raw Data

Prepared by:

Specialized Assays, Inc.
2960 Foster Creighton Drive
Nashville, TN 37204

(615) 726-0177

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB026 23'-23.5'

Matrix: Soil
% Dry Weight: 77.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127364
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/20/98
Analysis Time: 22:51
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	3170	.... J

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

ICO6SB026 40'-40.5'

Matrix: Soil
% Dry Weight: 80.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127365
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/20/98
Analysis Time: 23:19
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	3100	J

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB026 38.5-39'

Matrix: Soil
% Dry Weight: 81.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127366
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/20/98
Analysis Time: 23:48
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	2420	J

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB029 19'-19.5'

Matrix: Soil
% Dry Weight: 90.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127367
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/21/98
Analysis Time: 9:45
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	15600	....

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB030 29 20.5-21'
C2J 1/22/99

Matrix: Soil
% Dry Weight: 86.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127368
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/21/98
Analysis Time: 0:45
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	4650	.... J

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB029 32.5'-33'

Matrix: Soil
% Dry Weight: 80.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127369
Date Sampled: 10/14/98
Date Received: 10/17/98
Analysis Date: 10/21/98
Analysis Time: 1:14
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	56500	....

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB029 62-62.5'

Matrix: Soil
% Dry Weight: 79.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127370
Date Sampled: 10/15/98
Date Received: 10/17/98
Analysis Date: 10/21/98
Analysis Time: 1:43
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	2430	J

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

ICO6SB029 88'-89.5'

Matrix: Soil
% Dry Weight: 60.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127371
Date Sampled: 10/15/98
Date Received: 10/17/98
Analysis Date: 10/21/98
Analysis Time: 2:12
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	3400	J

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB028 16'-16.5'

Matrix: Soil
% Dry Weight: 85.
Units: ug/kg dry weight
Dilution Factor: 20.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127372
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/21/98
Analysis Time: 2:41
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	409000	

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB028 16.5-17'

Matrix: Soil
% Dry Weight: 77.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127373
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/21/98
Analysis Time: 3:39
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	4470	J

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB028 35'-35.5'

Matrix: Soil
% Dry Weight: 81.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127374
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/21/98
Analysis Time: 4:08
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	7210	J

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB028 50'-50.5'

Matrix: Soil
% Dry Weight: 80.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127375
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/21/98
Analysis Time: 4:37
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	2750	J

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB027 24.5'-25'

Matrix: Soil
% Dry Weight: 76.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127376
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/21/98
Analysis Time: 5:06
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	3370	J

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB027 41.5'-42'

Matrix: Soil
% Dry Weight: 82.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127377
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/21/98
Analysis Time: 5:35
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	3370	J

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Sample Identification

IC06SB027

53'-53.5'

Matrix: Soil
% Dry Weight: 77.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8015
Delivery Group: 117264
Instrument: PE-2
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 98-A127378
Date Sampled: 10/16/98
Date Received: 10/17/98
Analysis Date: 10/21/98
Analysis Time: 6:03
Sample QC Group: 9177

Extraction Date: 10/19/98

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	6080	J

SPECIALIZED ASSAYS INC. • 2960 Foster Creighton Dr. • P.O. Box 40566 • Nashville, Tennessee 37204-0566
615-726-0177 • 1-800-765-0980 • Fax 615-726-3404

Case Narrative
SDG 118279
11/11/98

Client: **Parsons Engineering Sciences, Inc.**
2101 Webster Street, Suite 700
Oakland, CA 94612

Client Project Number: 726876.36320 **Matrix: Soil**

Laboratory Project Number: 8185 **Number of Samples: 3**

Date Received: 10/17/98 **Date Collected: 10/14/98 through 10/16/98**

Sample Receipt

Three soil samples were received on 10/17/98 for extractable total petroleum hydrocarbons (TPH) and diesel range organics (DRO) analysis. The samples were held until the total analysis for TPH were reported. Upon instructions from the client three samples were extracted and analyzed for TPH using the California Title 22 Method, California Wet Method.

Extracted TPH-GRO

Samples submitted for TPH-GRO analysis exhibited acceptable surrogate recoveries. Matrix spike/matrix spike duplicate (MS/MSD) analysis was conducted on sample IC06SB028 (16-16.5). The gasoline fuel standard showed acceptable recovery and relative percent difference (RPD) value for the MS/MSD pair. The laboratory control sample (LCS) was within control. All instrument calibration was within method specified limits.

TPH-DRO

Samples submitted for TPH-DRO analysis exhibited acceptable surrogate recoveries. A laboratory blank spike pair was used for MS/MSD analysis. MS and MSD recoveries for diesel fuel was below laboratory established recovery limits. The MS/MSD pair RPD value was within acceptable limits. The LCS associated with this batch exhibited acceptable recovery of the spiked diesel fuel standard.

Paula Watts, MS
Technical Services
Specialized Assays

SPECIALIZED ASSAYS INC. • 2960 Foster Creighton Dr. • P.O. Box 40566 • Nashville, Tennessee 37204-0566
615-726-0177 • 1-800-765-0980 • Fax 615-726-3404

SPECIALIZED ASSAYS

Table of Contents
Sample Delivery Group: 118279

PARSONS ENGINEERING SCIENCE, INC.
[redacted].01 [redacted]ter [redacted], S[redacted]00
Oakland, California 94612
Phone: (510) 891-9085
FAX: (510) 835-4355

CHAIN OF CUSTODY RECORD

8185 118279

000003

Project No.: 726876.36320 Lab Account No.: 8185

Project Name/Location: McClellan AFB; SA6

Site Manager: Michael Phelps (Oakland, CA)

Project Manager: John Ratz (Denver, CO)

Samplers: (Initials and Signatures)

Lab: Bruce Schlatter
Specialized Assays Inc. (SAI)
2960 Foster Creighton Drive
Nashville, TN 37204
(615) 726-0177
Fax:(615) 726-3404

Sample ID	Date	Time	Begin Depth	End Depth	Matrix	NO. OF CONTAINERS	ORGANICS: TPH-gasoline/GRO (8015M)	ORGANICS: Extract. TPH/DRO (8015M)	ORGANICS: Leachable TPH (DI-WET/8015M) note 1	ORGANICS: BTEX (8020A)	INORGANICS: Moisture Content (ASTM D-2216)	Sample Remarks
IC06SB026	10/14/98	1045	23	23.5	soil	1	X	X	X	X	X	127364
IC06SB026	"	1046	23.5	24	soil	1					X	HOLD
IC06SB026	"	1116	36.5	37	soil	1					X	HOLD Do not R
IC06SB026	"	1112	37	37.5	soil	1					X	HOLD Do not R
IC06SB026	"	1115	39.5	40	soil	1					X	HOLD
IC06SB026		1116	40	40.5	soil	1					X	127365
IC06SB026		1105	35.5	36	soil	1					X	HOLD
IC06SB026		1114	38.5	40 (39)	soil	1					X	127366
IC06SB029	"	1335	18.5	19	soil	1					X	HOLD
IC06SB029		1340	19	19.5	soil	1					X	SB-A132111
IC06SB029		1340	20	20.5	soil	1					X	HOLD
IC06SB029		1341	20.5	21	soil	1					X	127368

Per Michael Phelps 10/27/98 15:10

Rush DI Wet TPH High only

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
	10/16/98				
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED FOR LAB BY: (SIGNATURE)	DATE	TIME
				10/17/98	9:00

SPECIFIC ANALYTICAL METHOD FOOTNOTES:
1. Deionized water extraction (California Title 22 method); DO LEACHABLE C IF TOTAL TPH IS DETECTED AND AFTER CONSULTATION WITH SITE MANAGER (PHELPS).

GENERAL COMMENTS/INSTRUCTIONS:
1. FAX chain-of-custod[illegible] check-in to site manager (Phelps).
2. QC and reporting limits of contract 726876.3016.00 must be met.
3. Option 2 pricing applies and IRPIMS electronic deliverable IS required.

Distribution: Original accompanies shipment; photocopy kept by samplers; copy FAXed to Parsons ES Site Manager by laboratory upon receipt of samples.

[redacted] ENGINEE[redacted]NG [redacted] SCIENCE, INC.
2101 Webster Street, Suite 700
Oak[redacted] Cal[redacted]a 94[redacted]
Phone: (510) 891-9085
FAX: (510) 835-4355

[redacted] CH[redacted]N [redacted] CUSTODY RECORD [redacted]

000004

Project No.: 726876.36320 Lab Account No.: 8185

Project Name/Location: McClellan AFB; SA6

Site Manager: Michael Phelps (Oakland, CA)

Project Manager: John Ratz (Denver, CO)

Samplers: (Initials and Signatures) [signature]

Lab: Bruce Schlatter
Specialized Assays Inc. (SAI)
2960 Foster Creighton Drive
Nashville, TN 37204
(615) 726-0177
Fax:(615) 726-3404

Sample ID	Date	Time	Begin Depth	End Depth	Matrix	NO. OF CONTAINERS	TPH-gasoline/GRO (8015M)	Extract. TPH/DRO (8015M)	Leachable TPH (DI-WET/8015M) note 1	BTEX (8020A)	Estimated	Moisture Content (ASTM D-2216)	Sample Remarks
1C06SB029	10/14/98	1423	32.5	33	soil	1	X	X	X	X	Cle-9.45	✓	Run DI Wet TPH GC; 98-A132112
1C06SB029	"	1426	31.5	32	soil	1	X	X	X	X		✓	#2(C)
1C06SB029	10/15/98	1001	62	62.5	soil	1	X	X	X	X		✓	~~1(2)2371~~
1C06SB029	"	955	61	61.5	soil	1	X	X	X	✓		✓	HOLD
1C06SB029	"	1330	87	87.5	soil	1	X	X	✓	✓		✓	HOLD
1C06SB029	"		88	88.5	soil	1	X	X	✓	✓		✓	1(2)2371
					soil								
					soil								
					soil								
					soil								
					soil								
					soil								

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
[signature]	10/16/98				
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED FOR LAB BY: (SIGNATURE)	DATE	TIME
			[signature]	10/17/98	9:00

SPECIFIC ANALYTICAL METHOD FOOTNOTES:
1. Deionized water extraction (California Title 22 method): DO LEACHABLE IF TOTAL TPH IS DETECTED AND AFTER CONSULTATION WITH SITE MANAGER (PHELPS).

GENERAL COMMENTS/INSTRUCTIONS:
1. FAX chain-of-custody on check-in to site manager (Phelps).
2. QC and reporting limits of contract 726876.3016.00 must be met.
3. Option 2 pricing applies and IRPIMS electronic deliverable IS required.

Distribution: Original accompanies shipment; photocopy kept by samplers; copy FAXed to Parsons ES Site Manager by laboratory upon receipt of samples.

CHAIN OF CUSTODY RECORD

PARSONS ENGINEERING SCIENCE, INC.
[illegible] Oakland, California 94612
Phone: (510) 891-9085
FAX: (510) 835-4355

Project No.: 726876.36320 Lab Account No.: 8185

Project Name/Location: McClellan AFB; SA6

Site Manager: Michael Phelps (Oakland, CA)

Project Manager: John Ratz (Denver, CO)

Samplers: (Initials and Signatures)

Lab: Bruce Schlatter
Specialized Assays Inc. (SAI)
2960 Foster Creighton Drive
Nashville, TN 37204
(615) 726-0177
Fax:(615) 726-3404

Sample ID	Date	Time	Begin Depth	End Depth	Matrix	NO. OF CONTAINERS	ORGANICS: TPH-gasoline/GRO (8015M)	ORGANICS: Extract. TPH/DRO (8015M)	ORGANICS: Leachable TPH (DI-WET/8015M) note 1	ORGANICS: BTEX (8020A)	INORGANICS: Moisture Content (ASTM D-2216)	OTHER	Sample Remarks
ICO6SB028	10/16/98	840	16	16.5	soil	1	X	X	X	X	X	TPHLC 7.5	Matr.Spike/MSD
ICO6SB028		845	16.5	17	soil	1	X	X	X	X	X		HOLD
ICO6SB028		846	17.5	18	soil	1	X	X	X	X	X		HOLD
ICO6SB028		935	35	35.5	soil	1	X	X	X	X	X		HOLD
ICO6SB028		930	34	34.5	soil	1	X	X	X	X	X		HOLD
ICO6SB028		1050	50	50.5	soil	1	X	X	X	X	X		HOLD
ICO6 SB28		1051	50.5	51	soil	1	X	X	X	X	X		HOLD
ICO6SB027	10/16/98	1215	24.5	25	soil	1	X	X	X	X	X		HOLD
ICO6SB027	"	1218	25.5	26	soil	1	X	X	X	X	X		HOLD
ICO6 SB027	"	1302	41.5	42	soil	1	X	X	X	X	X		HOLD
ICO6 SB027	"	1300	41	41.5	soil	1	X	X	X	X	X		HOLD
					soil								

Run DI WET TPH Lo + Hi

03-A13813

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
	10/16/98				
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED FOR LAB BY: (SIGNATURE)	DATE	TIME
				10/17/98	9:00

SPECIFIC ANALYTICAL METHOD FOOTNOTES:
1. Deionized water extraction (California Title 22 method); DO LEACHABLE IF TOTAL TPH IS DETECTED AND AFTER CONSULTATION WITH SITE MANAGER (PHELPS).

GENERAL COMMENTS/INSTRUCTIONS:
1. FAX chain-of-custody with check-in to site manager (Phelps).
2. QC and reporting limits of contract 726876.3016.00 must be met.
3. Option 2 pricing applies and IRPIMS electronic deliverable IS required.

Distribution: Original accompanies shipment; photocopy kept by samplers; copy FAXed to Parsons ES Site Manager by laboratory upon receipt of samples.

Cooler Receipt Form

Client: PARSONS

Cooler Received On: 10/17/98 And Opened On: 10/17/98 By: PAM R Buckingham

P. L Rupp
(Signature)

1. Temperature of Cooler when opened 4°C
2. Were custody seals on outside of cooler and intact? (Yes) No
   a. If yes, what kind and where: 2 front / back
   b. Were the signature and date correct? (Yes) No
3. Were custody papers inside cooler? (Yes) No
4. Were custody papers properly filled out (ink, signed, etc)? (Yes) No
5. Did you sign the custody papers in the appropriate place? (Yes) No
6. What kind of packing material was used? bubble wrap
7. Was sufficient ice used (if appropriate)? (Yes) No
8. Did all bottles arrive in good condition (unbroken)? PRB (Yes) No *
9. Were all bottle labels complete (#, date, signed, pres, etc)? (Yes) No
10. Did all bottle labels and tags agree with custody papers? (Yes) No
11. Were correct bottles used for the analysis requested? (Yes) No
12. If present, were VOA vials checked for absence of air bubbles and noted if found? (Yes) No
13. Was sufficient amount of sample sent in each bottle? (Yes) No
14. Were correct preservatives used? (Yes) No
15. Corrective action taken, if necessary: * TWO "ON hold" Samples were not rec'd
    a. Name of person contacted:
    b. Date

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SPL11

FedEx. USA Airbill

FedEx Tracking Number 800688993086

0200 Form ID No. FedEx Retrieval Copy

1 From

10/16/13 Sender's FedEx Account Number 1497-7673-7

Sender's Name Amanda Freeman Phone (510) 891-9085

Company PARSONS ENG SCIENCES INC

Address 2101 WEBSTER ST 7TH FL Dept./Floor/Suite/Room

OAKLAND State CA ZIP 94612

Your Internal Billing Reference Information 726876 36320

2 To

Recipient's Name D. Roberts/B. Schlatter Phone 615 726-0177

Company Specialized Assays Inc. (SAI)

Address 2960 Foster Creighton Dr Check here if residence

Dept./Floor/Suite/Room

City Nashville State TN ZIP 37204

For HOLD at FedEx Location check here

Hold Weekday 31 ☐ Hold Saturday

For Saturday Delivery check here: 30 ☒

4a Express Package Service *Packages under 150 lbs.* Delivery commitment may be later in some areas

1 ☒ FedEx Priority Overnight (Next business morning)

5 ☒ FedEx Standard Overnight (Next business afternoon)

3 ☐ FedEx 2Day* (Second business day)

20 ☐ FedEx Express Saver* (Third business day)

6 ☐ FedEx First Overnight (Earliest next business morning delivery to select locations) (Higher rates apply)

* Fed Ex Letter Rate not available. Maximum Charge One pound rate

4b Express Freight Service *Packages over 150 lbs.* Delivery commitment may be later in some areas

7 ☐ FedEx Overnight Freight (Next business day)

8 ☐ FedEx 2Day Freight (Second business day)

83 ☐ FedEx Express Saver Freight (Up to 3 business days)

(Call for delivery schedule. See back for detailed descriptions of freight services.)

5 Packaging 6 ☐ FedEx Letter 2 ☐ FedEx Pak (Declared value limit $500) 3 ☐ FedEx Box 4 ☐ FedEx Tube 1 ☒ Other Pkg.

6 Special Handling

Does this shipment contain dangerous goods? 4 ☐ Yes (Shipper's Declaration attached) ☐ Yes (Shipper's Declaration not required)

6 ☐ Dry Ice Dry Ice, 9, UN 1845 ____ kg (Dangerous Goods Shipper's Declaration not required)

CA ☐ Cargo Aircraft Only

7 Payment ☐ Obtain Recipient FedEx Account No

Bill to: 1 ☐ Sender (Enter FedEx account no. or Credit Card no. below) 2 ☒ Recipient 3 ☐ Third Party 4 ☐ Credit Card 5 ☐ Cash/Check

Credit Card No. Exp. Date

Total Packages 1 Total Weight 4 lb Total Charges

Credit Card Auth

8 Release Signature

287

WCSI 0/97 Rev. Date 5/97 Part #1910.0

800688993086

002920098 6

000003

fedEx. USA Airbill FedEx Tracking Number 802558982010 Form I.D. No. 0200 Recipient's Copy

From

e 10/16/98

der's me Amanda Freeman Phone (501) 911-4085

mpany Parsons E.S.

ress 2101 Webster #1700 Dept/Floor/Suite/Room

Oakland State CA ZIP 94612

Your Internal Billing Reference Information 726576-36320

To

pient's me D Polkas/B Schlatter Phone (617) 726-0177

mpany Advanced Assays Inc (SAT.)

ress 2760 Fosters Crossing Dr. Dept/Floor/Suite/Room

(Check here if residence (Extra charge applies for FedEx Express Saver))

"HOLD" at FedEx location, print FedEx address here)

Louisville State IN ZIP 47204

For HOLD at FedEx Location check here

Hold Weekday (Not available with FedEx First Overnight)

Hold Saturday (Not available at all locations) (Available for FedEx Priority Overnight and FedEx 2Day only)

For Saturday Delivery check here

(Extra Charge. Not available to all locations) (Available for FedEx Priority Overnight and FedEx 2Day only)

802558982010

4a Express Package Service Packages under 150 lbs. Delivery commitment may be later in some areas.

- [X] FedEx Priority Overnight (Next business morning)
- [ ] FedEx Standard Overnight (Next business afternoon)
- [ ] FedEx First Overnight (Earliest next business morning delivery to select locations) (Higher rates apply)
- [ ] FedEx 2Day (Second business day)
- [ ] FedEx Express Saver (Third business day)

FedEx Letter Rate not available. Minimum charge: One pound rate.

4b Express Freight Service Packages over 150 lbs. Delivery commitment may be later in some areas.

- [ ] FedEx Overnight Freight (Next business day)
- [ ] FedEx 2Day Freight (Second business day)
- [ ] FedEx Express Saver Freight (Up to 3 business days)

(Call for delivery schedule. See back for detailed descriptions of freight services.)

5 Packaging

- [ ] FedEx Letter
- [ ] FedEx Pak
- [ ] FedEx Box
- [ ] FedEx Tube
- [X] Other Pkg.

Declared value limit $500

6 Special Handling (One box must be checked)

Does this shipment contain dangerous goods?*

- [ ] No
- [ ] Yes (As per attached Shipper's Declaration)
- [ ] Yes (Shipper's Declaration not required)

- [ ] Dry Ice — Dry Ice, 9, UN 1845 ____ x ____ kg.
- [ ] CA Cargo Aircraft Only

*Dangerous Goods cannot be shipped in FedEx packaging

7 Payment (Obtain Recipient FedEx Account No.)

Bill to:

- [ ] Sender (Account no. in section 1 will be billed)
- [X] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

(Enter FedEx account no. or Credit Card no. below)

Total Packages	Total Weight	Total Declared Value*	Total Charges
1	5.5	$ .00	$

Credit Card Auth

*When declaring a value higher than $100 per shipment, you pay an additional charge. See SERVICE CONDITIONS, DECLARED VALUE, AND LIMIT OF LIABILITY section for further information.

8 Release Signature

Your signature authorizes Federal Express to deliver this shipment without obtaining a signature and agrees to indemnify and hold harmless Federal Express from any resulting claims.

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Questions?
Call 1-800-Go-FedEx (800)463-3339

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SPECIALIZED ASSAYS INC. • 2960 Foster Creighton Dr. • P.O. Box 40566 • Nashville, Tennessee 37204-0566
615-726-0177 • 1-800-765-0980 • Fax 615-726-3404

Total Petroleum Hydrocarbons
Diesel Range Organics
Sample Results
And
Summary Data

Prepared by:

Specialized Assays, Inc.
2960 Foster Creighton Drive
Nashville, TN 37204

(615) 726-0177

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SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

Parsons ES Sample: IC06SB029-19'-19.5'

PARSONS ENGINEERING/AFCEE EXT 8185
JOHN RATZ
1700 BROADWAY STE 900
DENVER, CO 80290

Lab Number: 98-A132111
Sample ID: IC06SB029
Sample Type: Soil
Site ID:

Project: 726876.36320
Project Name: MCCLELLAN AFB; SA6
Sampler:

Date Collected: 10/14/98
Time Collected: 13:40
Date Received: 10/27/98
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
GENERAL CHEMISTRY PARAMETERS										
TPH (Diesel Range)	0.07	mg/l	1.00	0.10	1	11/ 1/98	11:10	K.Walkup	8015B/3510	3612

TCLP Results

Analyte	Result	Units	Reg Limit	Matrix Spike Recovery (%)	Date	Method
TCLP Extraction	Completed				10/28/98	1311

ND = Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Analyst	Method
EPH	1000 ml	1.00 ml	10/29/98	M. Cauthen	3510

Surrogate	% Recovery	Target Range
surr-o-Terphenyl	75.	50. - 150.

Analysis performed on Leachable TPH (DI-WET/8015) extract.

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

Parsons ES Sample: IC06SB029-32.5'-33'

PARSONS ENGINEERING/AFCEE EXT 8185
JOHN RATZ
700 BROADWAY STE 900
DENVER, CO 80290

Lab Number: 98-A132112
Sample ID: IC06SB029
Sample Type: Soil
Site ID:

Project: 726876.36320
Project Name: MCCLELLAN AFB; SA6
Sampler:

Date Collected: 10/14/98
Time Collected: 14:25
Date Received: 10/27/98
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
GENERAL CHEMISTRY PARAMETERS										
TPH (Gasoline Range)	ND	mg/l	0.10	0.10	1	11/ 9/98	18:35	D.Ramey	8015M/5030	6633
TPH (Diesel Range)	1.06	mg/l	1.04	0.10	1	11/ 1/98	11:39	K.Walkup	8015B/3510	3612

TCLP Results

Analyte	Result	Units	Reg Limit	Matrix Spike Recovery (%)	Date	Method
TCLP Extraction	Completed				10/28/98	1311

ND = Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Analyst	Method
EPH	960. ml	1.00 ml	10/29/98	M. Cauthen	3510

Surrogate	% Recovery	Target Range
surr-o-Terphenyl	82.	50. - 150.
BTEX/GRO Surr., a,a,a-trifluorotoluene	113.	50. - 150.

Analysis performed on Leachable TPH (DI-WET/8015) extract.

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

Parsons ES Sample: IC06SB028-16'-16.5'

PARSONS ENGINEERING/AFCEE EXT 8185
JOHN RATZ
700 BROADWAY STE 900
DENVER, CO 80290

Lab Number: 98-A132113
Sample ID: IC06SB028
Sample Type: Soil
Site ID:

Project: 726876.36320
Project Name: MCCLELLAN AFB; SA6
Sampler:

Date Collected: 10/16/98
Time Collected: 8:40
Date Received: 10/27/98
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
GENERAL CHEMISTRY PARAMETERS										
TPH (Gasoline Range)	ND	mg/l	0.10	0.10	1	11/ 9/98	19:00	D.Raney	8015M/5030	6633
TPH (Diesel Range)	0.04	mg/l	1.01	0.10	1	11/ 1/98	12:08	K.Walkup	8015B/3510	3612

TCLP Results

Analyte	Result	Units	Reg Limit	Matrix Spike Recovery (%)	Date	Method
TCLP Extraction	Completed				10/28/98	1311

ND = Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Analyst	Method
EPH	995. ml	1.00 ml	10/29/98	M. Cauthen	3510

Surrogate	% Recovery	Target Range
surr-o-Terphenyl	75.	50. - 150.
BTEX/GRO Surr., a,a,a-trifluorotoluene	114.	50. - 150.

Analysis performed on Leachable TPH (OI-WET/8015) extract.

APPENDIX D
DATA QUALITY ASSESSMENT REPORT

DATA QUALITY ASSESSMENT REPORT
STUDY AREA 6
MCCLELLAN AIR FORCE BASE, CALIFORNIA

TRODUCTION

s Engineering Science electronic Level III validation was performed for ea 6 (SA6) McClellan Air Force Base (AFB) and consisted of electronically ua examining data deliverables to determine data quality. This included n of data qualifiers to the analytical results based on adherence to method and project-specific quality assurance/quality control (QA/QC) limits. ro cols reviewed included:

alytical holding times,

tho blanks (MB),

b nks (TB),

rogate spikes,

rix spikes/matrix spike duplicates (MS/MSDs),

orat ory control samples (LCSs), and

pi g cooler temperature.

ua iers were applied to analytical results during the data validation process. ver validated using method applicable guidelines and in accordance with the *Functional Guidelines for Organic Data Review* (USEPA, 1994a) and the *Fu tional Guidelines for Inorganic Data Review* (USEPA, 1994b).

llowing definitions provide explanations of the USEPA (1994a and 1994b) as gned to analytical results during data validation. The data qualifiers we applied to both inorganic and organic results.

The analyte was analyzed for and is not present above the reported sample quantitation limit (SQL).

The analyte was analyzed for and was positively identified, but the associated numerical value may not be consistent with the amount actually present in the environmental sample. The data should be considered as a basis for decision-making and are usable for many purposes.

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ATTACHMENT A

VALIDATED SAMPLES

TABLE A-1
ANALYTICAL METHODS BY SAMPLE LOCATION
STUDY AREA 6
MCCLELLAN AFB,

LOCID	SBD	SED	MATRIX	SW8015 - SW1311	SW8015 - SW3550	SW8015 - SW5030	SW8021 - SW5030
				(Cal WET)	(TPH-DRO)	(TPH_GRO)	(BTEX)
IC06SB026	23	23.5	SO		X	X	X
IC06SB026	38.5	39	SO		X	X	X
IC06SB026	40	40.5	SO		X	X	X
IC06SB027	24.5	25	SO		X	X	X
IC06SB027	41.5	42	SO		X	X	X
IC06SB027	53	53.5	SO		X	X	X
IC06SB028	16	16.5	SO	X	X	X	X
IC06SB028	16.5	17	SO		X	X	X
IC06SB028	35	35.5	SO		X	X	X
IC06SB028	50	50.5	SO		X	X	X
IC06SB029	0	0	WG				X
IC06SB029	19	19.5	SO	X	X	X	X
IC06SB029	20.5	21	SO		X	X	X
IC06SB029	32.5	33	SO	X	X	X	X
IC06SB029	62	62.5	SO		X	X	X
IC06SB029	88	88.5	SO		X	X	X